FLOW AUDIT STUDY

SUMMARY REPORT

JULY, 2000

Tributary Agencies

CITIES OF:
SAN JOSE
SANTA CLARA
MILPITAS

CUPERTINO Sanitary District

WEST VALLEY Sanitary District (Including: Campbell, Los Gatos, Monte Sereno, Saratoga)

COUNTY Sanitation Districts 2-3

SUNOL and BURBANK Sanitary Districts

San Jose/Santa Clara Water Pollution Control Plant

Administered by
City of San Jose
Environmental Services Department

"Working with our community to conserve natural resources and safeguard the environment for future generations."

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EXECUTIVE SUMMARY

The City of San Jose (City), as the administrator for the San Jose/Santa Clara Water Pollution Control Plant (Plant), implements the requirements of the National Pollutant Discharge Elimination System (NPDES) permit. One requirement of the 1998 permit was to submit a contingency plan of additional measures which would be implemented if the measures in the 1997 Revised Action Plan did not successfully bring the Plant's average dry weather effluent flow (ADWEF) to below 120 mgd. One element of the Contingency Plan was to require Flow Audit Studies of the Plant's largest dischargers.

Although the Plant has not exceeded the 120 mgd ADWEF since the Contingency Plan was approved, the discharge levels have been close enough that elements of the first tier were voluntarily implemented in 1998. One of those elements was the requirement that facilities discharging greater than 100,000 gpd must complete a Flow Audit Study (Audit). This report is a summary of the first round of this Audit program.

Findings and Discussion

Of the original 57 dischargers identified as meeting the Tier I criteria, 33 completed Audits were evaluated. Twenty-four dischargers were able to verify that their baseline flows were below 100,000 gpd or that they closed part or all of their facility. Although permitted industrial companies dominated the original participant list; non-permitted dischargers (hotels, hospitals, universities, jails, etc.) comprised nearly one-third of the final participant list. This shows that investigating flow reduction opportunities requires looking beyond the industrial sector, identifying measures that are applicable to other sectors as well.

Total flow from the participating companies decreased by three percent (3%) over the course of the study. But there was wide variation among companies as to how much flow changed over the same period.

More than 150 projects were identified from the 33 submitted Audits with a cumulative flow reduction potential of 3.5 mgd. One third of those projects were found to have a payback of five years or less. With complete implementation, these projects represent a potential flow reduction of nearly 1.0 mgd. Other projects with a payback of greater than five years may be made cost-effective with additional analyses and/or financial incentives.

Next Steps

The City will continue to promote the voluntary implementation of projects through the Water Efficient Technologies program that offers financial incentives for completed flow reduction projects. There is also a commitment to continue stakeholder participation by coordinating with the Silicon Valley Manufacturing Group, the Silicon Valley San Jose Chamber of Commerce, as well as other professional associations to continue promoting water efficiency.

The Flow Audit Study program is expected to be an ongoing strategy of the City's flow reduction efforts. The City will solicit comments and evaluate participant feedback about the protocol and process, amending and streamlining as necessary. The City will then compile a new list of companies meeting the Tier I criteria and continue with the Audit program.

ABBREVIATIONS

Audit	Flow Audit Study
ADWEF	Average Dry Weather Effluent Flow
AWNS	Acid Waste Neutralization System
CEFRM	Cost Effective Flow Reduction Measure
City	City of San Jose
DI	De-Ionized (water)
ESD	Environmental Services Department
NPDES	National Pollutant Discharge Elimination System
Plant	San Jose/Santa Clara Water Pollution Control Plant
RCM	Reasonable Control Measure
Regional Board	San Francisco Bay Regional Water Quality Control Board
RO	Reverse Osmosis
SBWR	South Bay Water Recycling
ULFT	Ultra Low Flush Toilet

gpd	gallons per day
gpm	gallons per minute
mgd	million gallons per day

I INTRODUCTION

The purpose of this report is to:

- Describe the development of the Flow Audit Study (Audit)
- Present and discuss findings from the Audits
- Discuss future efforts

With implementation of flow reduction projects as an ongoing element of the Audit process, this report focuses on the current status of the projects identified in the Audits as well as a review of the Audit process. This report discusses next steps as a means of guiding future efforts in maximizing water efficiency in the business sectors.

I-A BACKGROUND

The City of San Jose (City) is co-owner of and sole administrator for the San Jose/Santa Clara Water Pollution Control Plant (Plant). In the late 1980's concerns arose that years of freshwater discharge from the Plant to the southern reaches of the San Francisco Bay (South Bay) had resulted in the conversion of saltwater marsh to freshwater marsh, thereby impacting endangered species habitat. In response to marsh conversion and the need for protection of endangered species habitat, the City proposed the original *San Jose Action Plan* in 1991. The three main components of this plan were water conservation, water recycling, and marsh mitigation. Upon approval from the San Francisco Bay Regional Water Quality Control Board (Regional Board), the City adopted the *San Jose Action Plan* with a goal to reduce the average dry weather effluent flow[1] (ADWEF) from the Plant to under 120 million gallons per day (mgd).

The City proposed a *Revised South Bay Action Plan* in June 1997 amidst concerns that the Plant had attained several milestones outlined in the 1991 *San Jose Action Plan* but was exceeding the 120-mgd trigger. The *Revised South Bay Action Plan* is a comprehensive set of strategies designed to maintain dry weather flows below 120 mgd. These strategies include indoor water conservation, expansion of the South Bay Water Recycling (SBWR) system, increased reuse and recycling in industrial facilities, reduction of inflow and infiltration into the sanitary sewer system, and use of SBWR water for environmental enhancements.

In addition to elements in the 1991 Action Plan and the 1997 Revised Action Plan, the Regional Board directed the City to provide ample assurance that the ADWEF would be brought to and maintained below 120 mgd. The Board required the City to submit a *Contingency Plan* to that effect. The *Contingency Plan*, submitted in December 1997, consists of four progressively more stringent tiers. The elements therein are predominantly mandated approaches to efforts previously pursued with voluntary

[1] The lowest average flow for any 3 consecutive months between May and October

programs. The *Contingency Plan*'s tiers would be enacted only if the Plant's ADWEF exceeded 120 mgd in any year. These tiers culminate with a moratorium on new sewer connections.

The Regional Board approved the *Revised South Bay Action Plan* and the *Contingency Plan* and incorporated them as permit requirements in the Plant's 1998 National Pollutant Discharge Elimination System (NPDES) permit.

One element of Tier I of the *Contingency Plan* requires all commercial, industrial, and institutional dischargers whose flow to the sanitary sewer is 100,000 gallons per day (gpd) or more, to perform a flow audit and implement all cost-effective flow reduction measures. The Flow Audit Study (Audit) was a product of this element.

I-B AUDIT DEVELOPMENT

In June 1998, with support of the City Council, the City elected to proceed with implementation of several Tier I elements. This strategy was seen as a best defense in a year that would bring flows dramatically close to the 120-mgd trigger.

The Audit, and specifically its protocol document, was developed with stakeholder involvement as a priority. The City sent out letters to all potential Tier I permitted industrial dischargers in August 1998, notifying them of the City Council's decision and the imminent implementation of the Audit. City staff met with representatives from business and industry and other stakeholder groups in the summer and fall of 1998 to establish a general direction for the Audit and to understand how companies could best comply with this new requirement. By November 1998, as the Plant discharge dropped to just below 120 mgd, stakeholders concurred that while completion of the Audit would be mandatory, implementation of flow reduction measures identified would be voluntary. The voluntary effort would demonstrate a proactive partnership between local government and the business community. The Silicon Valley Manufacturing Group and the San Jose/Silicon Valley Chamber of Commerce expressed a willingness to help champion implementation in this voluntary endeavor. The City circulated drafts of the protocol document to various industry representatives and the Silicon Valley Pollution Prevention Center for review and comment. The City addressed much of the feedback received prior to finalizing the protocol document that was distributed to Tier I dischargers.

II STUDY METHODOLOGY

The first step of initiating the Audit process was to identify all facilities that discharged 100,000 gpd or more. Concurrently, the City proceeded with the development of the Audit protocol. Establishing implementation teams and intermediate checkpoints facilitated completion of the Audits. These steps are further described below.

II-A DISCHARGER IDENTIFICATION

The City started the Audit process in August 1998 by generating a list of all Industrial Users[2] or permitted companies whose regulated industrial discharge was greater than 75,000 gpd. The flows were based on 1997 data and were obtained from the City's Industrial User database. The City requested local water purveyors to provide water usage information on these dischargers as well as on non-permitted dischargers that used 100,000 gpd or more. An assessment of this information yielded 57 dischargers – 46 permitted and 11 non-permitted.

In December 1998, the City amended the Industrial Wastewater Discharge Permits for all the permitted dischargers requiring the completion of the Audit as a condition of their permit. The non-permitted dischargers identified included hospitals, jails, hotels, colleges/universities, and an amusement park. The City classified them as Critical Users[3] and required them to obtain Discharge Permits, with completion of the Audit as a permit condition.

II-B PROTOCOL DEVELOPMENT

The Audit Protocol[4] was designed to assist dischargers in evaluating all processes that use water or generate wastewater in their facility. It is divided into sections and worksheets that allow dischargers to identify and quantify the following information:

- Basic facility information
- Time and cost of performing the Audit
- All wastewater generating streams
- Existing flow reduction methods
- Additional applicable flow reduction methods
- Cost-benefit analysis
- Implementation schedule for flow reduction programs

[2] In accordance with the San Jose Municipal Code, Chapter 15.14, "Industrial User" means any non-residential user that discharges Industrial Wastes to the Sanitary Sewer System.

[3] In accordance with the San Jose Municipal Code, Chapter 15.14, "Critical User" means a Discharger whose wastewater contains Priority Pollutants, or who discharges wastes other than sanitary sewage which has the potential to cause Interference, or who discharges in excess of 100,000 gallons per day.

[4] The Flow Audit Study Protocol is available upon request by calling (408) 945-3000, or can be downloaded from our web site at http://www.ci.san-jose.ca.us/esd/fas.htm

The protocol included 50 measures to be assessed by each company. The first 41 were cited as Reasonable Control Measures (RCMs). They were developed primarily from the Mass Audit Study[5] Program in 1994. The remaining measures were called Cost Effective Flow Reduction Measures (CEFRMs) which represented measures that were not yet known to be cost-effective and technologically feasible. They were included in the study as testing for inclusion as RCMs in the future. Not all measures were appropriate for all participants because of the nature of their business and typical water uses. The measures were divided into sections, some of which were sector-specific to simplify completion of the Audit and data analysis.

An electronic version of the protocol was developed. The entire instructional section was made available on the City's website, as was a separate spreadsheet workbook file, which participants could use to enter data directly and print for submission.

II-C AUDIT IMPLEMENTATION

The City organized a workshop for City staff in November 1998 to explain the Audit protocol, implementation process, and criteria that would be used to review completed Audits. After notifying the dischargers of the Audit requirement, the City held an orientation workshop in December 1998. The goals of this workshop were to introduce the dischargers to their individual City team members, walk through the Audit Protocol, and set expectations for the outcome of the Audit. The City also distributed information on incentive programs available for the implementation of water efficiency projects.

Each discharger was assigned a three-person team from the City (2 Source Control Inspectors and a support member from an internal City team focussed on maximizing water efficiency in the industrial sector) to assist during the Audit process. For a permitted company, the company's current Source Control Inspector served as the lead for the Audit review and the main contact for the company. For a non-permitted discharger, an assigned Source Control Inspector served as the Audit review lead and contact. The support member provided technical assistance to the discharger or Source Control Inspector.

Individual discharger kick-off meetings began in December 1998. The City team met with the dischargers at their facilities to initiate the Audit. Typically, three checkpoint meetings were held between December 1998 and May 1999. As the Audits were completed and submitted, the City team began its review. The City Source Control Inspectors reviewed the Audits for completeness, accuracy, and any missing information. They attempted to resolve as many issues as possible by communicating

[5] In accordance with the San Jose Municipal Code, Chapter 15.14.325: "Mass Audit Study" means an investigation of pollution and source reduction measures performed by or for an Industrial User, pursuant to Audit Protocols adopted by the Director, to analyze the volume and concentration of nickel, copper, and/or any other Priority Pollutants identified in regulations adopted by the Director in an Industrial User's process streams and discharge, and to identify the Maximum Feasible Reduction measures available to the Industrial User.

with the discharger through phone calls or onsite meetings. If the issues were not sufficiently addressed, they sent out formal responses to the dischargers, clearly identifying deficiencies and requesting revision. The support member performed a final review of the Audits for content. The review process concluded in March 2000.

III FINDINGS

While 57 dischargers comprised the original list of Audit participants, this report evaluates the completed studies of 33 dischargers. Appendix A provides a list of all 57 participants, with the status of their study or an explanation for their removal from the list. As summarized in the table below, three permitted companies substantiated that while their water use exceeded 100,000 gpd, their discharge was below Tier I level. Another eighteen permitted companies closed altogether or shut down the manufacturing elements of their business during the course of the study. Thus, they did not complete an Audit.

TABLE 1. ORIGINAL PARTICIPANT LIST

# Companies	Status
33	Completed and included in this Report
3	Substantiated flows below 100,000 gpd
18	Closure
3	Other

Although permitted companies dominated the original participant list, non-permitted dischargers comprise nearly one-third of the final participant list. This finding illustrates that investigating flow reduction opportunities requires casting the net beyond the industrial customer base and seeking measures suited to other types of dischargers as well.

The Audits are summarized below for each participant. The description includes a general assessment of a discharger's Audit as submitted, and highlights circumstances or characteristics that affected the completion of the Audit. A list of projects is also included for each participant. This information is also included in Appendix B as part of a Full Audit Profile that also includes how each participant reviewed the reduction measures in the Audit protocol.

Analog Devices, PMI Division

SC-060A **Semiconductor**

1997 Flows (gpd)	127,582	Permitted Industrial Discharge
1999 Flows (gpd)	93,718	Permitted Industrial Discharge

The study submitted had some deficiencies that were, for the most part, resolved by the inspector, although no manufacturing details were provided. Analog Devices currently reuses RO reject and cooling tower blowdown water as make-up water in their scrubbers and again in the cooling towers. The two projects scheduled for implementation involved upgrading their DI water system and increasing the capacity of their reclaim system holding tank. The projects were estimated to have water savings of approximately 30,000 gpd.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Upgrade DI Water System	22,777	$251,327	$96,574	2.66	4/18/99		☑
2	Increase Capacity of Reclaim Water Holding Tank	7,280	$9,000	$3,800	2.37	4/15/99		☑
Total for All Projects		**30,057**	***gpd***					
Total for <5 Year Payback		**30,057**	***gpd***					
Total for Completed Projects		**30,057**	***gpd***					

California Paperboard Corp.

SC-005C Other Industrial: Paberboard

1997 Flows (gpd) 281,307 Permitted Industrial Discharge
1999 Flows (gpd) 466,298 Permitted Industrial Discharge

The study submitted was complete and gave very good detail to the manufacturing process. California Paperboard has completed several projects in the past two years, which were mentioned but not detailed in the Audit. One was the implementation of a "water loop" that improved the efficiency of their Hydrocal Disolved Air Flotation, reducing solids to the sanitary sewer by fifty percent, therefore reducing their loading to the Plant. This project was necessary to pave the way for the potential reuse of this water in other areas. California Paperboard has an on-going program to replace old water sealed pumps with water-less "pumpable" packing. Estimated water savings for this project when complete were 46,080 gpd. Another project identified was the installation of a Rossilator self-purging shower system for #1 paper machine felts. This project had not been approved at the time of the Audit submittal, but had potential water savings of 28,800 gpd. Since the audit was submitted, California Paperboard has purchased four Rossilator self-purging shower systems and has installed one on their #2 paper line. California Paperboard experienced difficulty with reusing industrial wastewater (e.g. plugging and bacterial growth) on the #2 paper line and has had to resort to using potable water until they can re-engineer the system to work with recycled water. They were continuing to try to resolve the issues and return to using their industrial wastewater before installing the other Rossilator systems on their remaining process lines (e.g. project #1). Because of the learning curve with the new Rossilator system, Cal Paperboard has experienced an increase in potable water use and industrial wastewater discharge.

California Paperboard began using SBWR water in their industrial process in 1998 and continues to use SBWR water at an average rate of 45 gpm - 75 gpm.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
	Water loop Project	0	$60,000	$0	0.00		Reduced solids discharging to the sewer by 50%, flow and cost not included	☑
	Inspection and Maintenance	20,000	$0	$0	0.00	6/3/99		☑
	Purple Water Project (for processes)	0	$0	$0	0.00	TBD	Gradually increasing use	☑
1	Install Rossilator self purging shower systems	28,800	$92,300	$16,800	5.49			☐
2	Pumpable Packing (no water used)	46,080	$46,800	$26,880	1.74	9/2001		☐
IC	Replace showerheads with low flow fixtures	250	$0	$0	0.00	TBD	Not included in project summary	☐
IIB	SBWR for irrigation	200	$0	$0	0.00	TBD	Not included in project summary	☐
IIIA	Replace with mechanical seals	125	$0	$0	0.00	TBD	Not included in project summary	☐
VA	Use of Statistical Process Control	0	$0	$0	0.00	TBD	Not included in project summary	☐

Total for All Projects **95,455** ***gpd***
Total for <5 Year Payback **46,080** ***gpd***
Total for Completed Projects **20,000** ***gpd***

Doubletree Hotel

SJ-DOUB Commercial: Hotel

1997 Flows (gpd) 139,782 Annual Water Consumption (SSUC Data)
1999 Flows (gpd) 107,368 Annual Water Consumption (SSUC Data)

Located just beyond the San Jose International Airport, the Doubletree Hotel includes 510 guest rooms and several conference facilities. At the outset of Audit coordination meetings, the Doubletree had just completed a renovation of half their guest rooms, with all fixtures being replaced except the toilets, which remained as 3.5 gallon-per-flush units. During the Audit, phase II of the renovation commenced with all fixtures including toilets being replaced with water saving models. The Doubletree had in the past made modifications to their laundry facilities and ice machines to maximize water efficiency. Most recently, they also remodeled the frequently used public area restrooms with ULFTs and automatic faucets.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	ULFTs in Public Area	3,800	$26,100	$6,200	4.21	03/00		☐
2	Increase CT cycles	2,901	$50,000	($3,666)	-13.64		Negative payback; Not scheduled	☐
3	ULFTs in Guest Rooms (2nd Half)	2,975	$92,055	$4,727	19.47		Not scheduled. Completed retrofit of half of guest room units 3/00.	☐
Total for All Projects		**9,676**	***gpd***					
Total for <5 Year Payback		**3,800**	***gpd***					
Total for Completed Projects			***gpd***					

Dynamic Details

MI-014A Printed Circuit Board Manufacturer

1997 Flows (gpd)	95,130	Permitted Industrial Discharge
1999 Flows (gpd)	147,058	Permitted Industrial Discharge

Dynamic Details is a circuit board shop whose production includes significant prototype work. Their original submission was on time but required some modification and additional information on the various steps in their manufacturing. The company has experienced tremendous growth over the last four years and has used every opportunity to upgrade equipment to include water saving features. They installed an automated Cuposit line and an automated DES line that featured sensor-controlled rinses and ion exchange to facilitate reuse. It was estimated that such technologies were saving more than 40,000 gpd. During the course of the Audit, they also retrofitted the restrooms with ULFTs and placed additional controls on the copper plating line to increase water savings. They were also moving forward on integrating Reverse Osmosis technology for reuse into their facility, having purchased an RO unit and contracted with a service provider for system design. Should this project prove feasible, it could result in the reuse of more than 40,000 gpd.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Bathroom modifications	1,975	$1,650	$2,739	0.60	5/13/99	Completed	☑
2	Installing RO for to reuse process water for rinsing	43,200	$74,950	$28,697	2.72	12/31/00		☐
3	Black Oxide/Multibond Automated Line	3,726	$200,000	$2,450	81.63	N/A		☐
4	Copper Electro Plating - Flow Controls	2,880	$1,250	$1,900	0.66	2/10/00		☑

Total for All Projects	**51,781**	***gpd***
Total for <5 Year Payback	**48,055**	***gpd***
Total for Completed Projects	**4,855**	***gpd***

Exchange Linen Services

SJ-022C **Other Industrial: Laundry**

1997 Flows (gpd) 117,063 Permitted Industrial Discharge
1999 Flows (gpd) 120,465 Permitted Industrial Discharge

Exchange Linen Service submitted a complete study in June 1999. They did a good job detailing water use at the facility and committed to the implementation of three flow reduction/water reuse projects with an estimated water savings of at least 45,000 gallons per day. The largest recycling project was the additional treatment and reuse of wastewater from the dissolved air flotation treatment process back into the washing process. Another project involved the 100% recycling of extractor coolant water to the cold water tank. The company had also committed to the continuation of replacing older toilets, urinals, faucets and shower heads to ultra low flow fixtures.

Overall, this Audit was well done and showed a good faith effort in finding process water efficiencies. The projects are scheduled for completion by the end of 2001.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Recycle treated wastewater (DAF) to washing process	46,045	$142,796	$42,893	3.33	11/2001		☐
1A	Retrofit toilets and urinals	344	$0	$0	0.00	4/2000	No cost data provided	☐
1B	Retrofit faucets with aerators	79	$0	$0	0.00	3/2000	No cost data provided	☐
1C	Retrofit shower	6	$0	$0	0.00	3/2000	No cost data provided	☐
2	Recycle extractor coolant water	1,000	$1,739	$2,979	0.58	5/2000		☐
Total for All Projects		**47,474**	***gpd***					
Total for <5 Year Payback		**47,045**	***gpd***					
Total for Completed Projects			***gpd***					

Fairmont Hotel

SJ-FAIR **Commercial: Hotel**

1997 Flows (gpd) 147,942 Annual Water Consumption (SSUC)
1999 Flows (gpd) 141,870 Annual Water Consumption (SSUC)

The Fairmont is a 544-room, luxury hotel in the heart of downtown San Jose. Their clientele is largely a business audience; thus their occupancy, while high, generally includes only one person per room.

While their Audit study was submitted on time, it was largely incomplete. Completed information was made available with additional requests. With only "industry average" information available, it was difficult to assess project payback at this site; guest room usage was estimated at 77,000 gpd but what part of that is attributable to toilet use greatly impacts whether replacement of their 3.5 gpf toilets is a cost-effective project. The project was determined to have a project payback of 20 years. The only project determined to be cost effective was the use of water softening to increase the cycles of concentration on the cooling towers. This would result in savings of approximately 4,000 gpd and was slated to be considered by management for completion in 2001. In the last year Fairmont merged with a Canadian hotel chain that has a comprehensive environmental program. Expansion of that effort to the local site may result in additional water saving projects.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	ULFTs and Urinals	4,577	$159,694	$7,457	21.42	N/A		☐
2	Cooling Tower Water Softeners	6,956	$12,410	$6,387	1.94	2001	Need Owner's Approval	☐
Total for All Projects		**11,533**	***gpd***					
Total for <5 Year Payback		**6,956**	***gpd***					
Total for Completed Projects			***gpd***					

Good Samaritan Hospital

SJ-GOOD **Institutional: Hospital**

1997 Flows (gpd) 117,189 Reported in FAS. Need Water Co Info
1999 Flows (gpd) 117,189 Reported in FAS. Need Water Co Info

The study submitted had minor deficiencies that were resolved after a comment letter was sent. This facility replaced one of its cooling towers in 1999 to a more efficient system, exceeding our minimum reasonable control measure of 5 cycles of concentration and reducing the discharge from the unit by 55 percent. This hospital was strongly opposed to installing ultra low flush toilets due to an unsuccessful pilot of these toilets approximately 10 years ago. They were also opposed to installing low flow showerheads and faucets. Staff committed to continuing to work with the hospital representatives to try to provide information to help them realize greater potential domestic water use efficiencies in the future.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
	Replace Cooling Tower for More Efficient Model	0	$0	$0	0.00	4/99	no cost or flow data provided	☑
Total for All Projects		**0**	***gpd***					
Total for <5 Year Payback			***gpd***					
Total for Completed Projects		**0**	***gpd***					

HADCO

SC-027A **Printed Circuit Board Manufacturer**

1997 Flows (gpd) 355,614 Permitted Industrial Discharge
1999 Flows (gpd) 463,318 Permitted Industrial Discharge

The study submitted had some deficiencies and several meetings were held to resolve the flow balance issues. Five projects were identified as applicable and four were scheduled for immediate implementation with estimated water savings of 39,000 gpd. Because of the increase in weighted average layer count (WALCO) in the products being manufactured at this site, (the increase in board layers requires additional rinsing and slower rinse times), HADCO has implemented a stringent in-house water auditing process. They continue to evaluate ways to reduce, reuse or recycle their wastewater in an effort to minimize their increase in water usage. Currently 40% of HADCO's processing water is reused on site.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	B-2 Line #2 Rinses retrofit Project	7,720	$895,685	$0	5.00	8/31/99	Payback was not calculated because not benefit given, but <5 year payback	☑
2	B-2 Line #3 rinses retrofit & developer rinse recycle project	10,600	$172,697	$0	5.00	11/30/99	Payback was not calculated because not benefit given, but < 5 year payback	☐
3	B-2 Line #4 rinses retrofit & developer project rinse water	10,600	$172,697	$0	5.00	11/30/99	Payback was not calculated because not benefit given, but < 5 year payback	☐
4	B-2 Line #5 rinses retrofit & developer project rinse water	10,600	$172,697	$0	5.00	11/30/99	Payback was not calculated because not benefit given, but <5 year payback	☐
5	Triple Rinse Drum wash station	6,281	$16,056	$0	0.00	TBD	No benefits or payback given	☐
NA	Employee Training	0	$0	$0	0.00	2/5/99	Not cost or flow data provided	☑
NA	Showerheads	0	$0	$0	0.00	3/1/99	Not cost or flow data provided	☑

Total for All Projects **45,801** ***gpd***
Total for <5 Year Payback **39,520** ***gpd***
Total for Completed Projects **7,720** ***gpd***

Hewlett Packard

SJ-003A Semiconductor

1997 Flows (gpd) 306,448 Permitted Industrial Discharge
1999 Flows (gpd) 287,864 Permitted Industrial Discharge

Hewlett Packard Company (HP) required an extension to the original timeline; their final Audit submittal was received August 16, 1999. Minor adjustments were promptly made to satisfy all discrepancies. The site consisted of two manufacturing and one service building. The complex manufacturing processes were detailed to a level adequate to address the purposes of this study. All reported information was credible and well documented. Six of eight flow reduction projects were scheduled for implementation. Both RCMs and 4 other projects were on the implementation schedule. Two projects not scheduled for implementation did not meet the criteria as economically feasible for implementation. The quality of the project evaluation and documentation was appropriate for the study.

Since completing the study, HP's diversion of groundwater to the storm drain has been completed. They need to dewater their basement because of a high water table. That water had previously been discharged to the sanitary sewer system, but after pursuing the appropriate approvals, HP diverted that water to discharge directly to the storm sewer system. While this project does not result in a decrease in water used at the site, it does reduce flows to the sanitary sewer system by more than 40,000 gpd.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Domestic Flow Reduction (toilets and shower)	11,725	$0	$0	0.00	12/31/99	Cost data was left blank	☑
2	Move Bulk Storage Operation Overseas	18,720	$0	$0	0.00	04/23/99	Cost data was left blank	☑
3	Convert 4 Inch to 6 Inch Wafer Fab	45,000	$0	$0	0.00	12/31/00	Cost data was left blank	☐
4	DI Reclaim using EDI	36,000	$306,000	$127,810	2.39	01/01/02		☐
5	Divert Groundwater to Storm Drain	48,000	$5,000	$12,143	0.41	TBD		☑
6	Groundwater Reclaim Treatment for Facility Use	36,000	$425,000	($78,183)	-5.44			☐
7	Divert Liquid Ring Vacuum Pump Leak to Scrubber	2,400	$25,000	$971	25.75			☐
8	Idle flow rate reduction	1,000	$0	$0	0.00	11/01/99	Cost data was left blank	☐

Total for All Projects **198,845** ***gpd***
Total for <5 Year Payback **84,000** ***gpd***
Total for Completed Projects **78,445** ***gpd***

IBM Corporation

SJ-007A Disk/Head Manufacturer

1997 Flows (gpd) 547,746 Permitted Industrial Discharge
1999 Flows (gpd) 481,637 Permitted Industrial Discharge

The study submitted was basically complete, however a letter was sent asking for clarification on a few items. All issues were quickly resolved. The flows and water usage were presented in detail with the exception of the manufacturing process, which was shown with no specific breakdown. Five projects were identified in the study which if implemented, could have an estimated flow reduction of 289,850 gpd. No projects were scheduled for implementation in the Audit, however the three projects which were considered Reasonable Control Measures (RCMs) are being investigated by their staff to ensure that there are no barriers with future implementation.

IBM has implemented significant flow reduction projects in the recent past, such as the construction of a segregated wastewater treatment plant which allows them to reuse approximately 50% of their process wastewater in their cooling towers. As part of their ISO 9001 and ISO 14001 programs, IBM has integrated the evaluation of water use reduction into product and process development cycles. They have converted many of their tools to the efficient spray rinse technology which has reduced the amount of water and chemicals used in the manufacturing process. IBM has made a commitment to continue to evaluate and implement cost-effective approaches to reducing water usage and sewer discharges at their facilities.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Reuse treated rinse water, CT blowdown & R.O. reject for	122,500	$1,985,970	$143,000	14.00			☐
1RCM	Install ULFTs	43,450	$0	$0	0.00			☐
2	Increase R.O. Feed water recovery.	109,500	$837,970	$85,000	10.00		Similar to second pass RO with ion exchange softener	☐
2RCM	Reuse treated wastewater for pump seals at Conc. Plant	7,200	$0	$0	0.00			☐
3RCM	Recycle vacuum pump seal water	7,200	$0	$0	0.00			☐
Total for All Projects		**289,850**	***gpd***					
Total for <5 Year Payback			***gpd***					
Total for Completed Projects			***gpd***					

Intel Corporation D2P3

SC-249A **Semiconductor**

1997 Flows (gpd)	361,313	Permitted Industrial Discharge
1999 Flows (gpd)	375,429	Permitted Industrial Discharge

The flow audit study submitted was basically complete. The flows and water usage were presented in detail with the exception of the manufacturing process, which was shown with no specific breakdown. Some additional general manufacturing information was submitted later, but was done on theoretical bases, not from actual site measurements. Two types of projects were identified: the use of reverse osmosis reject water in the cooling towers and the improvement of pH controls for the scrubbers. These projects would reduce the amount of make-up water previously used by approximately 137,700 gpd at the D2P3 facility. Both projects were scheduled for implementation and have since been completed.

Although Intel did not give specific site details of their manufacturing processes, they have implemented many rinse efficiencies within their manufacturing process. They stated a commitment to incorporating the best available rinse technologies and where possible, rinse water segregation, as process lines were retooled. They are developing an industrial wastewater reuse program with the intention of recycling dilute rinsewater from their new P4 fab back into the industrial city water tank for use in cooling towers and/or scrubbers. Piloting of this system may begin by 2001.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Ro Reject to the Cooling Towers	65,754	$43,600	$71,686	0.61	6/30/99		☑
2	pH Control for Scrubbers	72,000	$236,590	$91,014	2.60	11/30/98		☑
3	SBWR recycled water for irrigation	0	$0	$0	0.00	TBD	Currently working with SBWR to connect	☐

Total for All Projects	**137,754**	*gpd*
Total for <5 Year Payback	**137,754**	*gpd*
Total for Completed Projects	**137,754**	*gpd*

Intel Corporation, D2

SC-028A **Semiconductor**

1997 Flows (gpd)	293,359	Permitted Industrial Discharge
1999 Flows (gpd)	163,205	Permitted Industrial Discharge

The flow audit study submitted was basically complete. The flows and water usage were presented in detail with the exception of the manufacturing process, which was shown with no specific breakdown. Some additional general manufacturing information was submitted later, but was done on theoretical bases, not from actual site measurements. Two types of projects were identified: the use of reverse osmosis reject water in the cooling towers and the improvement of pH controls for the scrubbers. These projects would reduce the amount of make-up water previously used by approximately 160,000 gpd at the D2 (P1/P2) facility. Both projects were scheduled for implementation and have been completed.

Although Intel did not give specific site details of their manufacturing processes, they have implemented many rinse efficiencies within their fabs, particularly in the tape automated bonding operations. They stated a commitment to incorporating the best available rinse technologies and where possible, rinse water segregation, as process lines were retooled. They are developing an industrial wastewater reuse program with the intention of recycling dilute rinsewater from their new P4 fab back into the industrial city water tank for use in cooling towers and/or scrubbers. Piloting of this system may begin by 2001.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	RO Reject to the Cooling Towers	43,836	$29,067	$47,389	0.61	06/30/99		☑
2	pH Control for the Scrubbers Project	115,200	$157,723	$77,446	2.04	11/30/98		☑
3	SBWR recycled water for irrigation	0	$0	$0	0.00	TBD	Currently working with SBWR to connect	☐
Total for All Projects		**159,036**	***gpd***					
Total for <5 Year Payback		**159,036**	***gpd***					
Total for Completed Projects		**159,036**	***gpd***					

Jefferson Smurfit

SC-003C Other Industrial: Paperboard

1997 Flows (gpd) 300,936 Permitted Industrial Discharge
1999 Flows (gpd) 310,308 Permitted Industrial Discharge

The study submitted had minor deficiencies that were clarified after meeting with the discharger. Nine projects were identified and six were scheduled for implementation with a potential wastewater discharge reduction of more than 33,000 gpd. Because they were scheduled for implementation, the company did not complete the cost analysis sheets for all projects identified.

Jefferson Smurfit is scheduled to be connected to the South Bay Water Recycling (SBWR) system and is planning to phase in the use of SBWR water by replacing approximately 10% of their potable water used in manufacturing and/or irrigation with SBWR water. The use of SBWR water in the cooling towers needed further evaluation before they would consider using it as a permanent source of water to the towers.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Removal of anti-freeze water from clay pumps.	180	$210	$0	0.00	5/31/99		☑
2	Instant hot water heaters on wash basins.	5	$600	$0	0.00	5/31/99		☑
3	ULFT installation.	568	$5,499	$0	0.00	3/31/00		☑
4	Shield shower nozzle size.	24,480	$1,280	$0	0.00	12/31/99		☑
5	Internal lubrication shower for press roll	8,000	$5,000	$0	0.00	ongoing		☐
6	SBWR water for irrigation	0	$0	$0	0.00	ongoing	SBWR replaces 3000 gpd water used, but not flow into sewer	☐
7	SBWR water for cooling tower makeup	0	$0	$0	0.00	N/A	Not cost effective due to cycle up time (not evaluated in Worksheets 5D-5G)	☐
8	Mechanical Seals	0	$0	$0	0.00	N/A	Already uses process water	☐
9	Injectable Packing on Pumps (no seal water)	0	$0	$0	0.00	N/A	Already using process water	☐
Total for All Projects		**33,233**	***gpd***					
Total for <5 Year Payback			***gpd***					
Total for Completed Projects		**25,233**	***gpd***					

Komag Inc. Bldg 10

SJ-341A **Disk/Head Manufacturer**

1997 Flows (gpd) 118,502 Permitted Industrial Discharge
1999 Flows (gpd) 73,067 Permitted Industrial Discharge

Komag is a rigid magnetic memory hard disk manufacturer. Two facilities, Komag Buildings 6 and 9 were closed in 2000. The study for Building 10 was received on time and completed after responding to the comments provided to them. Komag also broke down processes by function, which eased review. Although Komag did not identify any new water reduction projects, several RCMs were existing and they did state that they are committed to water conservation.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
	None	0	$0	$0	0.00			☐

Total for All Projects	**0**	*gpd*
Total for <5 Year Payback		*gpd*
Total for Completed Projects		*gpd*

Linear Technology

MI-006A **Semiconductor**

1997 Flows (gpd) 179,937 Permitted Industrial Discharge
1999 Flows (gpd) 204,377 Permitted Industrial Discharge

Linear Technology is a semiconductor company focussed on linear integrated circuits. Their first submission was on time but required clarification of discrepancies in the flow balance. Their final submittal did clarify the overall flow balance but approximately 27,000 gallons per day of flow remains as "Other Non Potable Uses". Linear Technology identified these uses but flow rates for each remain underdetermined, and flow balances of those individual uses are accomplished without accounting for the flows from "Other Non-Potable Uses". The manufacturing uses were originally noted only as a single use; subsequent breakdown did not identify flow volumes specific to the steps in the process. As with several companies, the evaluation of RCMs was completed only for the fab as a single unit, so it was unclear to what extent rinse efficiency measures were being employed.
The company reclaims more than 33,000 gpd from their process lines for use in the cooling towers and scrubbers. That reclaim system, however, also requires more than 11,000 gpd of city make up water to meet demand. They cited space constraints for treatment equipment as the barrier to replacing this make up water with other reclaimable waters. No cost-effective projects were identified through the Audit; however, Linear did replace their showerheads in March 2000 despite citing that project as having a payback greater than five years.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Showerhead retrofit	40	$741	$52	14.14		Payback based on simple payback calculation	☑
2	SBWR to Gray water (process reclaim) for low periods,	0	$69,525	($126)			Additional SBWR usage: 11,596 gpd. Neg Annual Benefit	☐
3	Gray Water to Bldg. 2 Scrubber	0	$68,750	($1,240)			Additional SBWR usage: 2,452 gpd. Neg Annual Benefit	☐

Total for All Projects	**40**	*gpd*
Total for <5 Year Payback		*gpd*
Total for Completed Projects	**40**	*gpd*

Lockheed Martin Fairchild Systems

MI-072A Semiconductor

1997 Flows (gpd) 98,714 Permitted Industrial Discharge
1999 Flows (gpd) 63,604 Permitted Industrial Discharge

This Lockheed site is a semiconductor manufacturer, specializing in unique applications rather than high volume production. They submitted the Audit on time but with significant clarification needed, including more detail on the distinct processes in the fab and a balance of flows throughout the facility. While the breakdown on the fab was completed, the challenge of balancing the flows for this facility remained, largely due to their aggressive and successful pursuit of flow reduction. Since some of these water-saving projects took place during the year they were using to complete the study, it confounded the data and made it difficult to balance overall flows. In 1998 (the subject year used for the study), they installed a reclaim system which uses water from the AWNS in scrubbers and cooling towers, saving more than 25,000 gpd. During completion of their Audit, they also implemented a project in the fab sinks to reuse idle rinse waters and restrict idle flow volumes. It is estimated that this project resulted in additional savings of more than 35,000 gpd. Since completion of the Audit, this company installed a new effluent flow meter and planned to submit a revised flow balance diagram, including reuse loops, in summer of 2000.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Rerouting RO Reject direct to sewer	525	$4,691	$205	28.24		In accordance with FAS, implementation not required at this time.	☐
2	ULFTs and Urinals	780	$6,000	$1,110	5.40		In accordance with FAS, implementation not required at this time.	☐
3	Replace showerheads	40	$25	$57	0.44		In accordance with FAS, implementation not required at this time.	☐
4	Employee Training	1,500	$1,200	$2,135	0.56		In accordance with FAS, implementation not required at this time.	☐
Total for All Projects		**2,845**	***gpd***					
Total for <5 Year Payback		**1,540**	***gpd***					
Total for Completed Projects			***gpd***					

LSI Logic

SC-046A **Semiconductor**

1997 Flows (gpd) 218,548 Permitted Industrial Discharge
1999 Flows (gpd) 203,606 Permitted Industrial Discharge

LSI Logic is a semiconductor manufacturing facility. Their original submission was on time and required only minor clarifications on flows and some of the project evaluation. Additional information was submitted in a timely manner. While LSI Logic was completing the Audit, they were also amidst a flow reduction project to reuse a significant portion of their process water. That project did not prove fruitful but they continue to pursue alternative avenues such as reuse of treated process water into scrubbers and cooling towers. Additionally, while evaluating rinse efficiency measures for the Audit, they found significant opportunities for savings in reducing flows in process sinks during idle production periods. A project was implemented immediately with water savings of 9,000 gpd at minimal cost to the company. The AWNS reuse project has a potential water savings of more than 40,000 gpd.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Process Wastewater to Scrubbers/CTs	43,600	$171,865	$19,103	9.00	5/30/00		☐
2	Batch sink idle flow reduction	9,050	$8,500	$17,215	0.49	3/30/00	Completed	☑
3	High Efficiency RO for Ultra Pure Water	43,600	$136,560	$15,047	9.08	5/24/99	Installed Installed	☑

Total for All Projects	**96,250**	*gpd*
Total for <5 Year Payback	**9,050**	*gpd*
Total for Completed Projects	**52,650**	*gpd*

Micrel Inc.

SJ-258A **Semiconductor**

1997 Flows (gpd) 130,291 Permitted Industrial Discharge
1999 Flows (gpd) 149,609 Permitted Industrial Discharge

Micrel, a semiconductor manufacturer, submitted its flow audit study on time. After responding to a comment letter, the forms were determined to be complete. The methods used to calculate flow data versus actual flow meter readings were questionable. Micrel chose not to break down its manufacturing processes and some of the methods used did not provide adequate references.

Among the projects Micrel listed, spray rinsing should also have been evaluated. They already had a two stage RO system installed prior to 1998. Only fab water reduction, optimization of cooling tower's cycles of concentration, and recycle of pump "gland" water were determined to be within a five-year payback. The only potential CEFRMs considered applicable included softening in cooling towers. However, this measure was not further evaluated or discussed further in the flow audit study. Cost data for all projects were considered questionable and the arguments for technical unfeasibility of reusing process water were inadequate.

Nevertheless, Micrel did commit to purchasing water efficient technology at the time of replacement for older tools and sinks. Micrel will implement the fab water reduction project starting in June 2000 and intends to replace its existing cooling towers with more water efficient models in the next two years as part of a major facility upgrade. Micrel will also evaluate the use of ultra low flush toilets/urinals on a trial basis.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
2	Minimizing Fab Waste (repairing leaks, training, etc.)	7,200	$33,528	$51,237	0.65			☐
3	Reusing Process Water in Scrubbers	7,300	$168,610	$8,655	19.48		greater than 5 year payback	☐
4	Replacing Toilets and Urinals with Ultra Low Flush Fixtures	3,403	$65,949	$3,405	19.37		greater than 5 year payback, but will evaluate more fully	☐
5	Addition of Second RO for incoming process water	16,950	$163,922	$16,473	9.95	12/97	Already existing, just given for costs	☐
7	Optimization of Cooling Towers	10,303	$79,249	$21,353	3.71		Will evaluate with installation of new cooling towers	☐
8	Recycling pump "gland" water (seal water)	2,160	$7,480	$1,970	3.80	TBD	Implementation will be determined by Micrel	☐
Total for All Projects		**47,316**	***gpd***					
Total for <5 Year Payback		**19,663**	***gpd***					
Total for Completed Projects			***gpd***					

Paramount Great America

SC-PARA Commercial: Theme Park

1997 Flows (gpd) 271,469 Annual Water Consumption (excluding landscape)
1999 Flows (gpd) 163,707 Annual Water Consumption

Perhaps the most unique of all our large dischargers, Great America is an amusement park complete with thrill rides and live entertainment. Their discharge is very seasonal since the park is not consistently open year round. Off-peak activities still include large group events and park maintenance. The park has an on-site recycling system whereby most of the rides discharge to a large lake from which water is pumped for irrigation and for backup supply for fire protection.

Since completing the Audit, the park began using SBWR water where well water had previously been used. This includes some irrigation, pond makeup, and fire protection. Their use of SBWR was estimated at 60,000 gpd. Additional projects were evaluated but none were found cost effective, with the exception of simple faucet modifications. The largest project would be the replacement of older toilets with Ultra Low Flush models. But the 194 public area toilets are special "blow-out" types commonly used in extremely high traffic applications. Unfortunately, there is no ULFT retrofit counterpart to them; thus replacement would require extensive wall repair and retiling.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	SBWR for Ponds & Irrigation	0	$53,177	$44,085	1.21	Completed	Completed	☑
2	Install Low Flow Fixtures	69,308	$1,072,057	$25,926	41.35		Only as needed with remodeling	☐
3	Pump Gland water substitution	0	$34,521	$5,896	5.85		Not Cost Effective, no flow data, sewer benefits, not included	☐
4	Faucet Modifications	1,700	$1,235	$1,073	1.15	TBD		☐
6	Nickelodeon backwash reroute for reuse	18,000	$62,116	$4,158	14.94		Not Cost Effective	☐
7	Water saver for laundry	874	$12,410	$301	41.23		Not Cost Effective	☐

Total for All Projects	**89,882**	*gpd*
Total for <5 Year Payback	**1,700**	*gpd*
Total for Completed Projects	**0**	*gpd*

Read-Rite Corp.

MI-004A Disk/Head Manufacturer

1997 Flows (gpd)	112,185	Permitted Industrial Discharge
1999 Flows (gpd)	51,550	Permitted Industrial Discharge

The study submitted was not complete after sending a comment letter and attempting to obtain the missing information in person. Missing pieces of information included a fully detailed block flow diagram and completed worksheets for Section 4C. Read-Rite had stated in correspondence that there were no meters at the locations where their recycling/reuse occurs. The City may pursue this information in the future. However, since Read-Rite submitted information confirming the permanent closure of their wafer fab production at this site for relocation to Fremont and the flows have been reduced by more than 50 percent, the City will not require them to provide the flow details at this time. The only processes remaining at this location are the Tape Head division and the Slider Fab production. Three reasonable control measures were identified; none were scheduled for implementation.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
II.A.	Reuse of process water for irrigation	1,850	$0	$0	0.00			☐
II.AI	Cooling tower cycles improved to 5.5.	20,250	$0	$0	0.00			☐
V.C.	Employee training	1,500	$0	$0	0.00			☐
Total for All Projects		**23,600**	***gpd***					
Total for <5 Year Payback			***gpd***					
Total for Completed Projects			***gpd***					

San Jose Medical Center

SJ-SJME **Institutional: Hospital**

1997 Flows (gpd)	149,145	Annual Water Consumption (SSUC)
1999 Flows (gpd)	155,387	Annual Water Consumption (SSUC)

The study submitted had minor deficiencies that were resolved after a comment letter was sent. Overall, the detailing of the flows/water use within the complex was well done.

Major portions of this facility are scheduled for closure within the next two years because many of the structures cannot meet the new seismic requirements that will be enforced in 2003. Because of this, the City did not require them to evaluate the cost of replacing their existing toilets at this facility, since the largest number of the toilet replacements would be in an area scheduled for closure. The facilities director expressed commitment to water efficiency. The hospital's cooling towers have been running at approximately six cycles of concentration for many years, they have replaced the shower heads with low-flow shower heads, and they have a strong inspection and maintenance program in place. The four projects evaluated were scheduled for implementation by the middle of 2000. These projects have a potential reduction of at nearly 10,000 gpd.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Vacuum Pump Water Recycle	3,400	$12,000	$4,000	3.00	3/1/00		☐
2	Instrument Washers Sterris System	2,500	$80,000	$1,825	43.84	12/15/99		☐
3	Waterless hand sanitizer	4,000	$0	$2,900	0.00		Capital cost and payback data not provided, implementation ongoing	☑
4	Water Wise Employee Training	0	$0	$0	0.00		No flow or cost data or implementation date.	☑

Total for All Projects	**9,900**	***gpd***
Total for <5 Year Payback	**3,400**	***gpd***
Total for Completed Projects	**4,000**	***gpd***

San Jose State University

SJ-SJSU **Institutional: Educational**

1997 Flows (gpd) 675,891 Annual Water Consumption
1999 Flows (gpd) 538,829 Annual Water Consumption

San Jose State's major operation besides student instruction includes power production from a power generation plant. San Jose State submitted its Audit on time and all flows and water uses appeared to be consistent and accurate. However, water use in the laboratory was not evaluated for flow reduction methods because the water use in the labs was not considered significant. Of the projects evaluated, three were deemed cost effective. These include the use of SBWR in cooling towers and awareness training for employees.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Urinal replacement	300	$22,645	$471	48.08			☐
2	Toilet replacement	510	$23,699	$401	59.10			☐
3	Showerhead replacement	9,828	$32,748	$7,714	4.25	TBD		☐
4	SBWR for cooling towers	0	$39,684	$18,094	2.19	6/1/99		☑
5	SBWR for main campus irrigation		$58,021	$8,497	6.83	TBD	Awaiting DHS Approval	☐
6	Employee Awareness Training	0	$1,803	$856	2.11	TBD		☐

Total for All Projects	**10,638**	*gpd*
Total for <5 Year Payback	**9,828**	*gpd*
Total for Completed Projects	**0**	*gpd*

Sanmina Corp. Plant I

SJ-022A **Printed Circuit Board Manufacturing**

1997 Flows (gpd) 72,247 Permitted Industrial Discharge
1999 Flows (gpd) 93,551 Permitted Industrial Discharge

The study submitted had minor deficiencies that were corrected during site meetings. The studies for Sanmina I and Sanmina II were basically the same because both plants are designed with a similar layout. Sanmina has automated lines which were designed with some reasonable control measures in place; however, Sanmina also stated that the automated process line design prevented them from implementing many other reasonable control measures. There are no cooling towers at either of these facilities. One type of project was evaluated for both facilities and even though the payback was greater than 5 years, it was scheduled for implementation. The project is a wastewater treatment system that would pretreat the final effluent for reuse in manufacturing using ion exchange and deionization. It is estimated that approximately 25,000 gpd could be treated and reused in the manufacturing process at each facility. Sanmina scheduled to complete these projects by December 2000.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Recycling of treated process wastewater in process	25,928	$117,387	$6,606	17.77	9/1/00		☐

Total for All Projects	**25,928**	*gpd*
Total for <5 Year Payback		*gpd*
Total for Completed Projects		*gpd*

Sanmina Corp. Plant II

SJ-043A **Printed Circuit Board Manufacturing**

1997 Flows (gpd)	103,682	Permitted Industrial Discharge
1999 Flows (gpd)	121,326	Permitted Industrial Discharge

The study submitted had minor deficiencies that were corrected during site meetings. The studies for Sanmina I and Sanmina II were basically the same because both plants are designed with a similar layout. Sanmina has automated lines which were designed with some reasonable control measures in place; however, Sanmina also stated that the automated process line design prevented them from implementing many other reasonable control measures. There are no cooling towers at either of these facilities. One type of project was evaluated for both facilities and even though the payback was greater than 5 years, it was scheduled for implementation. The project is a wastewater treatment system that would pretreat the final effluent for reuse in manufacturing using ion exchange and deionization. It is estimated that approximately 25,000 gpd could be treated and reused in the manufacturing process at each facility. Sanmina scheduled to complete these projects by December 2000.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Recycling of treated water into process	25,299	$117,387	$6,006	19.54	12/30/00		☐
Total for All Projects		**25,299**	***gpd***					
Total for <5 Year Payback			***gpd***					
Total for Completed Projects			***gpd***					

Santa Clara County, Elmwood Correctional Facility

MI-ELMW Institutional: Correctional

1997 Flows (gpd) 140,075 Annual Water Consumption (excluding irrigation)
1999 Flows (gpd) 159,437 Annual Water Consumption (excluding irrigation)

The Santa Clara County Elmwood Jail is a correctional facility. After several meetings and a comment letter the jail completed its Audit.

Sources and uses of water were grouped and illustrated in a series of 6 process block flow diagrams. Since inmates need special toilets to prevent clogging, ULF toilets and urinals were evaluated for jail employees only. Showerhead replacements were evaluated for both employees and inmates. These showerheads and a faucet flow control/timer for the pot wash in the cafeteria were determined to be cost effective. The project startup dates were yet to be determined.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Shower Head Replacement	2,965	$42,693	$11,892	3.59	TBD	Implementation schedule to be determined	☐
2	Urinals Replacement	980	$34,039	$1,687	20.18			☐
3	Toilet Replacement	4,200	$75,030	$7,220	10.39			☐
5	Cafeteria Pot Wash Restrictors/Timers	1,344	$1,295	$2,307	0.56	TBD	Implementation schedule to be determined	☐
6	Faucet Spring Load	1,800	$30,368	$1,453	20.90			☐
Total for All Projects		**11,289**	***gpd***					
Total for <5 Year Payback		**4,309**	***gpd***					
Total for Completed Projects			***gpd***					

Santa Clara County, Main County Jail

SJ-MAIN **Institutional: Correctional**

1997 Flows (gpd) 166,751 Annual Water Consumption (SSUC)
1999 Flows (gpd) 140,452 Annual Water Consumption (SSUC)

The Santa Clara County Main Jail is a correctional facility. They have applied for an IU Permit as a Tier 1 critical user. After several meetings and a comment letter the jail completed its Audit.

Sources and uses of water were grouped and illustrated in a series of six process block flow diagrams. Since inmates need special toilets to prevent clogging, ULF toilets and urinals were evaluated for jail employees only. Showerhead replacements were evaluated for both employees and inmates and determined to above a five-year payback. Faucet timers for the pot wash in the cafeteria and increasing cycles of concentration at cooling tower operations were also determined to be cost effective. Project startup dates were yet to be determined. Although irrigation with SBWR recycled water was not included in the Audit, off-line efforts with SBWR to connect them are already in place.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Replace Showerheads	1,092	$8,537	$1,563	5.46			☐
2	Flushometer and Urinal replacement	560	$39,378	$806	48.86			☐
3	Toilet Replacement	2,088	$32,065	$2,933	10.93			☐
5	Pot Wash Timers/Controls	1,520	$1,294	$2,173	0.60	TBD	Implementation schedule to be determined	☐
6	Cooling Tower Optimization to 5 cycles	1,974	$39,773	$12,538	3.17	TBD	Implementation schedule to be determined	☐
Total for All Projects		**7,234**	*gpd*					
Total for <5 Year Payback		**3,494**	*gpd*					
Total for Completed Projects			*gpd*					

Santa Clara University

SC-UNIV **Institutional: Educational**

1997 Flows (gpd) 203,395 Annual Water Consumption (excluding landscape)
1999 Flows (gpd) 286,748

Santa Clara University is a private university. The Audit for SCU was incomplete. Although Santa Clara University evaluated the flow reduction RCMs and their applicability, a cost-benefit analysis of each applicable RCM was not provided. Also, an evaluation of the cooling towers on the Santa Clara University campus was not completed.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
	Toilets, urinals and lavatory fixtures	0	$0	$0	0.00	TBD	On an ongoing basis	☐
	SBWR for irrigation	0	$58,021	$8,497	6.83	12/00	Already started	☐
Total for All Projects		**0**	*gpd*					
Total for <5 Year Payback			*gpd*					
Total for Completed Projects			*gpd*					

Santa Clara Valley Medical Center

SJ-SCVM **Institutional: Hospital**

1997 Flows (gpd) 294,596 Annual Water Consumption
1999 Flows (gpd) 264,594 Annual Water Consumption

The study submitted was not complete. There were mathematical errors as well as a general lack of documentation of data used to evaluate and calculate project costs. A comment letter was sent and some of the discrepancies were resolved. Most of the potential water savings at the hospital will come from optimizing their cooling towers; implementing a pump gland water recycling loop for seals; and replacing toilets, faucets and showerheads. There is an overwhelming reluctance from SCVMC to implement any significant flow reduction project in the areas previously mentioned. Benchmarking other medical facilities and developing materials on water efficiency opportunities specific to hospitals may pursuade SCVMC to reconsider. Staff will continue to work with the hospital representatives to try to provide information to help them realize greater potential water efficiencies in the future.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
01	Toilet Replacement (not including patients)	220	$20,001	$173	115.61		10 toilets per year, >5 year payback	☐
02	Sinks and Faucets		$0	$0	0.00		No flow or cost data given, not scheduled	☐
03	Showers	0	$0	$0	0.00		No flow or cost data given, not scheduled	☐
04	Cafeteria	400	$2,761	$314	8.79		>5 year payback	☐
05	Patient Care Faucets	0	$0	$0	0.00		Sink aerators considered not applicable due to OSHPD	☐
06	Patient Care Toilets	0	$0	$0	0.00		Stated as not applicable due to OSHPD objections, but OSHPD said OK	☐
07	Patient Care Restrooms and Bathtubs	0	$0	$0	0.00		Sink aerators considered not applicable due to OSHPD, but shower heads OK	☐
09	Cooling Towers	7,675	$76,277	($1,182)	-64.53		No payback	☐
10	Vacuum Pumps/Breathing Air	10,080	$15,441	$5,563	2.78	TBD		☐
11	Cart washer	0	$0	$0	0.00		Not considered applicable due to OSHPD	☐
12	Sterilizers	0	$0	$0	0.00		Not considered applicable due to OSHPD	☐
13	Employee Awareness Training	1,136	$2,293	$894	2.56	TBD		☐

Total for All Projects **19,511** ***gpd***
Total for <5 Year Payback **11,216** ***gpd***
Total for Completed Projects ***gpd***

Seagate Technology

MI-061A Semiconductor

1997 Flows (gpd) 251,728 Permitted Industrial Discharge
1999 Flows (gpd) 263,836 Permitted Industrial Discharge

The study was completed after responding to comments provided to them. Seagate broke down the manufacturing processes by function and provided good detailed explanations in the comment section for rinse reduction RCMs. Several RCMs were existing and they did a thorough evaluation of the applicability of other RCMs, although they stated that more information needed to be collected to determine the technical feasibility and capital costs for some projects.

Seagate exercised the option not to commit to any given flow reduction project at this time, noting that when a project was funded, they would notify the City. Seagate already used RO/DI to reclaim process water. There was an issue with total organic carbon to further expand recycling of treated wastewater back to process.

In addition to including water reduction measures in many of their processes, Seagate also included two different projects designed to close-loop the facility. Since there is no limit to the amount of water used per process in a closed-looped system, the water rate recirculated given was greater than the current total water use and discharge for the existing facility. A closed-loop system would actually only use water for evaporation makeup; virtually none would be discharged. Each closed-loop project was mutually exclusive and should not be interpreted as additive or as in addition to the other projects listed.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Replacing Toilets with Ultra Low Flow Fixtures	2,489	$16,539	$2,900	5.70	TBD		☐
10	Spray Rinses	108,900	$0	$150,000	0.00	TBD	Project cost and payback need to be determined	☐
11	Wet Benches with built-in recycling	155,000	$0	$213,000	0.00	TBD	Project cost and payback need to be determined	☐
2	Reusing Process Water for Irrigation	12,672	$97,596	$39,700	2.46	TBD		☐
3	Reusing RO Reject/Process Water in Cooling Towers	29,000	$47,175	$17,345	2.72	TBD		☐
4	Counter Current Rinse Systems on Wash	28,800	$0	$35,000	0.00	TBD	Project cost and payback need to be determined	☐
5	Counter Current Rinse System on Final Clean	86,400	$0	$106,000	0.00	TBD	Project cost and payback need to be determined	☐
6	Reuse of Process Rinse Water	0	$0	$0	0.00	TBD	Project cost, annual benefit, and payback need to be determined	☐
7	Reuse of Treated Wastewater Project #1	558,000	$0	$560,000	0.00	TBD	Project cost and payback need to be determined, annual benefit similar to 4&5	☐
7a	Reuse of Treated Wastewater Project #2	558,000	$0	$200,000	0.00	TBD	Seagate indicated <1 payback, but no cost data provided.	☐
8	Air Agitation	148,600	$0	$20,000	0.00	TBD	Project cost and payback need to be determined	☐
9	Tank Arrangement	27,000	$0	$37,000	0.00	TBD	Project cost and payback need to be determined	☐
Total for All Projects		**1,714,861**	***gpd***					
Total for <5 Year Payback		**41,672**	***gpd***					
Total for Completed Projects			***gpd***					

Sorrento Cheese Co.

SJ-016C **Other Industrial: Food Processing**

1997 Flows (gpd) 217,550 Permitted Industrial Discharge
1999 Flows (gpd) 261,160 Permitted Industrial Discharge

Sorrento Cheese completed its Audit after responding to a letter sent with minor comments. Sorrento Cheese is a cheese manufacturer and therefore, must comply with strict milk production regulations to prevent contamination. These regulations prevent Sorrento Cheese from recycling process water in most applications. The method used to calculate toilet flowrates were questionable, but the flow rates provided for other processes were deemed adequate. Sorrento Cheese also already reuses some water in their processes at the few locations allowed by the milk production regulations.

Although most of the project cost data were questionable especially for the toilet installations, two projects were determined to have a five year payback or less and were implemented in 1999: replacement with steam vacuum eductors and detergent recovery.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Replacing 3 Toilets with Ultra Low Flow Fixtures	112	$16,434	$1,057	15.55			☐
2	Replacing 3 Vacuum Pumps with Steam Vacuum Eductors	28,300	$63,095	$16,981	3.72	1999		☑
3	Detergent Recovery	11,747	$294,931	$55,084	5.35	1999		☑
4	Reusing Process Water for Floor Cleaning	10,000	$285,710	$24,451	11.69			☐
Total for All Projects		**50,159**	***gpd***					
Total for <5 Year Payback		**28,300**	***gpd***					
Total for Completed Projects		**40,047**	***gpd***					

Unisil

SC-236A **Semiconductor**

1997 Flows (gpd)	43,584	Permitted Industrial Discharge
1999 Flows (gpd)	28,331	Permitted Industrial Discharge

Unisil grows and slices silicon wafers. As the discharger list was being compiled, this facility was combined with a neighboring one owned by the same company because water use for the two sites was intimately connected. However, after a change in ownership and during the study, it was decided that since this facility had two distinct discharge points with separate permits, the flows were to be separated and only this Audit was to be reviewed, although the flow from this facility was less than 50,000 gpd.

Although they were sent two comment letters and met with staff several times, the resulting product was confusing and incomplete. The flow data as presented was difficult to follow. No new projects were included or evaluated though some rinsing methods could have been. However, this site already implemented some of the RCMs, including reusing RO reject water in the scrubbers, reusing 25,000 gpd of DI water in the fab areas, and replacing plate washers with plate dryers.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
A	RO Reclaim to Scrubber	4,000	$2,000	$1,000	2.00	1/99		☑
B	Recycling of DI Process Water to rinses	20,000	$6,000	$3,000	2.00	2/98		☑
C	Plate Dryer versus Plate Washer	100	$2,000	$10,000	0.20	1998		☑
Total for All Projects		**24,100**	***gpd***					
Total for <5 Year Payback		**24,100**	***gpd***					
Total for Completed Projects		**24,100**	***gpd***					

UniSil Corp.

SC-295A **Semiconductor**

1997 Flows (gpd)	198,499	Permitted Industrial Discharge
1999 Flows (gpd)	205,824	Permitted Industrial Discharge

This Unisil also grows and manufactures silicon wafers. Company personnel completed most of the Audit after responding to a comment letter although a few minor details were incomplete. The flow data were broken down by function and appeared to be accurate.

Rinse reduction RCMs were deemed too expensive, but not evaluated for cost as instructed in the Audit Protocol. The evaluation of the replacement of toilets with ultra low flush fixtures was only partially completed. Response to comments was not received in time to verify cost data. The Audit should have also included an evaluation of reusing process water.

The projects evaluated and scheduled were for the reuse of RO reject into the facility's three cooling towers, three fume scrubbers, and NOX scrubbers.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
2	Replacing DI rinse water in lapping with RO reject or	12,000	$0	$0	0.00		No cost data or schedule for implementation	☐
CT #1	Reusing RO Reject in 3 Cooling Towers	18,000	$7,500	$1,875	4.00	2001		☐
CT #2	Reusing RO reject in 3 Fume Scrubbers and 1 NOX	20,000	$7,500	$1,875	4.00	2001		☐
Total for All Projects		**50,000**	***gpd***					
Total for <5 Year Payback		**38,000**	***gpd***					
Total for Completed Projects			***gpd***					

Vishay - Siliconix, Inc.

SC-033A Semiconductor

1997 Flows (gpd) 336,133 Permitted Industrial Discharge
1999 Flows (gpd) 255,100 Permitted Industrial Discharge

The study submitted in June 1999 was not complete. Discrepancies in the document were eventually resolved. Additional information was requested to verify some project costs and calculations used. In particular, the costs for replacing toilets were questioned. The manufacturing process (fab) was not detailed. Most of the reasonable control measures were deemed applicable or existing.

Five projects were identified as having a payback of 5 years or less. While no schedule for implementing projects was provided, Vishay-Siliconix has implemented their cooling tower optimization project, the fab water conservation effort, and the closure of Fab 2. They are also 80% complete on a water reuse project, not included in their project list, which will reuse approximately 60,000 gallons per day of RO reject water in their cooling towers and/or scrubbers. This project is scheduled to be completed by the end of summer 2000.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
01	SBWR for irrigation	0	$27,113	$1,212	22.37		>5 year payback	☐
02	Replace toilets/urinals with ultra-low flow fixtures	6,264	$320,894	$5,237	61.27		>5 year payback	☐
03	Alternate Scrubber Supply	63,360	$174,219	$58,445	2.98	TBD	Cost Recalculated by ESD	☐
04	Optimize Control on Cooling Towers/Humidifiers	12,556	$82,163	$28,731	2.86	TBD	Cost Recalculated by ESD	☑
05	2nd stage RO	33,000	$207,590	$19,814	10.48	TBD	>5 year payback. Cost Recalculated by ESD	☐
06	Water conservation in Fab	73,200	$40,376	$131,969	0.31	TBD		☑
08	Add aerators/restrictors to faucets	1,350	$5,108	$1,063	4.81	TBD		☐
09	Liquid Ring Vacuum Pump Water Recycle	3,888	$6,066	$7,281	0.83	TBD	Cost Recalculated by ESD	☐
10	Pump gland water recycle	2,160	$11,357	$1,702	6.67		>5 year payback. Cost Recalculated by ESD	☐

Total for All Projects **195,778** ***gpd***
Total for <5 Year Payback **154,354** ***gpd***
Total for Completed Projects **85,756** ***gpd***

IV DISCUSSION OF FINDINGS

There are several aspects to analyzing the findings from the completed Audits. A review of the participant flows in 1997 when the study began and in 1999 when the studies were submitted provides both a company-specific and cumulative picture of how flows have changed over the course of the study. With each company being required to assess a fixed set of efficiency measures, it is helpful to look across companies to evaluate which measures hold potential for future reductions and which are less effective as flow reduction tactics. And finally, compiling all projects identified through the Audits illustrates the potential flow reductions to be accomplished as the emphasis shifts from Audit completion to project implementation.

IV-A Flow Comparison

The total 1997 flows for the 33 subject dischargers were 7.17 mgd. For industrial facilities, the flow is based on the permitted industrial discharge flow and does not include domestic and non-process wastewater. For non-industrial facilities, flow information is obtained from water retailer records. In calculating the total flow, dedicated landscape is omitted; however, irrigation and other losses[6] that represent water used but not discharged to the sanitary sewer system are included.

TABLE 2. PARTICIPANT FLOW BY CUSTOMER TYPE

Customer Type	# Sites	'97 Total Flow (gpd)	% of Total
Semiconductor	12	2,546,136	36.4%
Printed Circuit Board	4	626,673	12.1%
Disk / Head Mfr.	3	778,433	9.1%
Other Industrial	4	916,856	12.1%
Commercial	3	559,193	9.1%
Institutional	7	1,747,042	21.2%

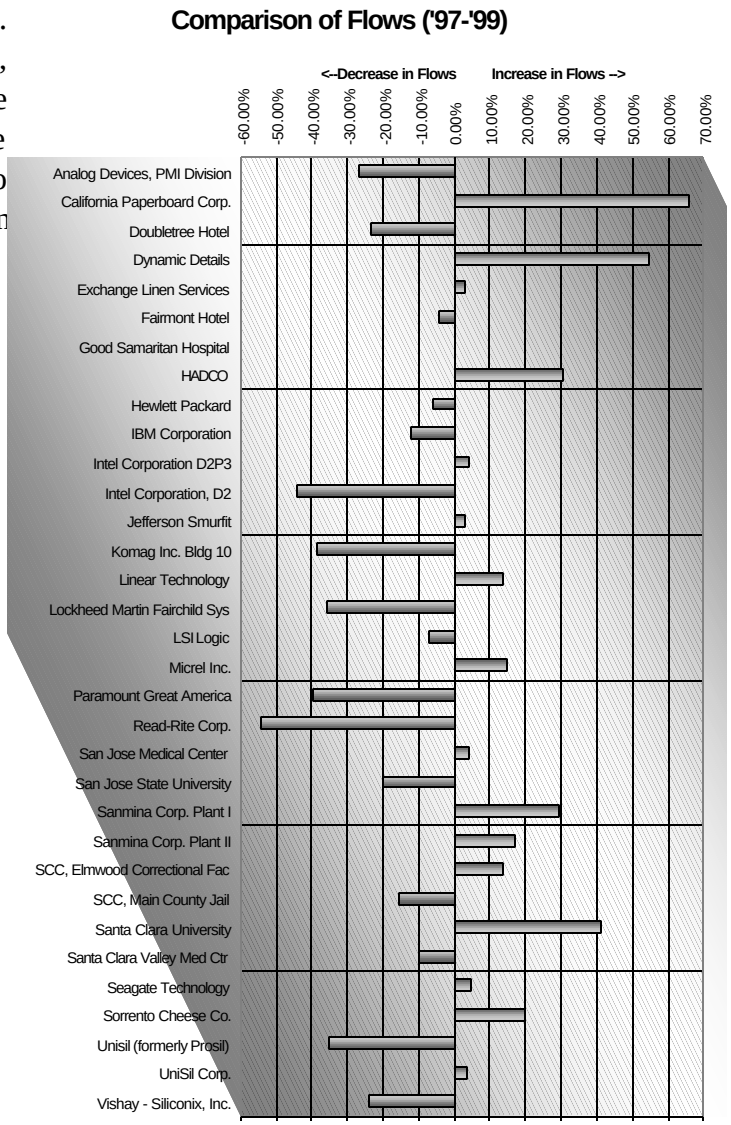
As shown in the table above, the semiconductor manufacturing sector was the largest contributor of flow, accounting for 36% of the total flow from participating dischargers. The institutional sector, though more varied, totaled 21% of the flow. Non-industrial sites accounted for nearly one third of the participating companies and collectively discharged just over 30% of total participant flow.

[6] An example of such losses includes water diverted for use in cooling towers.

TABLE 3. TOTAL PARTICIPANT FLOW

Total Flow for Subject Companies - '97	7.17 mgd
Total Flow for Subject Companies - '99	6.96 mgd
Change	0.214 mgd (or 3%)

Total flow from the subject companies decreased over the course of the study by 214,000 gpd or roughly 3% of '97 flows. The following Comparison of Flows chart reveals that the decrease is actually a net effect of all the companies, which when viewed individually experienced dramatically different flow changes. Looking at individual companies, five increased their flow by more than 20% of 1997 figures. Nine companies, however, were able to decrease their flow by more than 20% during the study period.



IV-B Assessment of Measures

The Audit included evaluation of *Reasonable Control Measures* (RCMs) and additional, potentially feasible measures. Participants were required to assess whether these measures already existed in their facility, were not applicable to their site, or were applicable for implementation at their facility. In some cases, measures noted as applicable were further evaluated as having a payback greater than five years. A number of measures were specific to only certain industry types, e.g., semiconductor manufacturers, and so were assessed only by pertinent companies.

Appendix B includes an Audit profile by company that details each measure a participant evaluated. The Audit Measures Matrices in Appendix C illustrate a comparison of measure assessment by company type or sector. Often times, however, to really understand how the entire group of companies, or a particular sector, evaluated a specific measure, it is necessary to see both the categorical reply and the supplemental explanations provided. Appendix D lists the responses of all 33 companies in a single summary for each of the 50 measures used in the Audit.

Overall, the measures were divided into 5 subsections. Reviewing the comparison of participant assessments provides insights into how many companies have already implemented a particular measure, whether companies reviewed measures using common assumptions, whether a measure has potential as a flow reduction tactic, etc. A summary of those comparisons by subsection is included below.

IV-B1 General Facility RCMs

The measures relating to the overall operation of a facility included reduction and reuse opportunity associated with sanitary fixtures, irrigation, pumps and seals, and procedural processes. All participants were required to assess the applicability of the measures in this subsection.

RCMs for sanitary fixtures were largely rated as existing or applicable. Retrofitting with Ultra Low Flush Toilets (ULFTs), however, did receive 13 ratings of having a greater than 5-year payback, particularly among the commercial and institutional participants, where there are a large number of fixtures per facility. It had been expected that for these companies, sanitary uses would dominate water consumption and be an important water-savings opportunity. For some dischargers, e.g., the Correctional Facilities and Great America, special fixtures for these more unique settings make retrofit more difficult. Financial incentives might help bring the cost of retrofit to within acceptable payback periods for some dischargers.

Other measures in this section did not rate well as opportunities for additional efficiency. For irrigation, most of those with process water cited poor water quality as making reuse for irrigation prohibitive. Companies near the SBWR

system were already connected or in the process of negotiating connection. Most companies (64%) have mechanical pump seals. Reuse of process wastewater for a seal was not well rated for reasons ranging from water quality concerns to the relatively high cost for this low water-using element. Procedural measures such as maintenance and inspection were largely noted as existing where applicable; no qualitative information about the effectiveness of such measures was required.

IV-B2 HVAC and Scrubber RCMs

These measures propose the use of reclaimed or SBWR waters in mechanical systems such as boilers, cooling towers, and scrubbers. All dischargers were required to assess the applicability of these measures.

While boilers did not rate well as a high-potential source for flow reduction, cooling towers revealed significant potential. Most of those with cooling towers (59%) are already operating them at cycles of concentration of five or more. Three companies noted that 5 cycles was not possible for them because of related reuse projects. Still, 7 companies cited increasing the cycles of concentration as an applicable measure. Another 5 noted that reusing other waters, e.g., process wastewater or RO reject, would be an applicable measure for cooling towers.

Half the participating companies do not have scrubbers. For those that do, scrubber wastewater was generally evaluated as not appropriate for reuse in other systems. But ten companies indicated that scrubbers were a viable place to reuse process wastewater. For the few that noted concerns about water quality and high cost as reasons for not implementing such a project, it may be that financial assistance and technology transfer could warrant reconsideration. Therefore scrubber feed water did show a solid potential as a reuse opportunity for process wastewater.

IV-B3 Process Water Reduction RCMs for Printed Circuit Board Manufacturers, Metal Finishing Industries, and Similar Businesses

This subsection included measures related to rinsewater reduction, reuse of rinse waters, and rinse agitation methods.

Many of the measures involving flow control methods rated as already existing or not applicable for most respondents. Flow restrictors, counter current rinses, spray rinse systems, sensor activated rinses, and timer flow controls were identified as existing in at least some of the processes for all PCB and Disk/Head participants. Evaporative makeup systems and foggers were noted primarily as not applicable because of inadequate rinse quality or minimal significance on water use. Participants were not consistent, however, with

whether or how they broke down various processes within their manufacturing, so a more detailed comparison of the degree to which measures are implemented is difficult.

Water reuse methods varied but there were common themes amongst similar business types. PCB participants were more likely to reuse rinsewaters back in process, with the degree of treatment depending on water quality needs. They were not inclined to reuse these waters in mechanical systems, citing either water quality concerns or insignificant use of cooling towers and scrubbers. Disk/Head Manufacturers are currently reusing treated rinsewaters in mechanical systems but cite water quality concerns as the main reason for reluctance to recycle waters back to process.

Measures related to rinse agitation methods offered few opportunities for additional savings. Few noted them as applicable for their processes, but most showed at least some of them as existing in parts of their fab. Again, differences in how manufacturing was segregated into distinct processes makes detailed evaluation difficult.

While a separate section of measures was included for the semiconductor industry, three semiconductors completed all or part of this section as well. They note that they currently employ several of the rinse flow control methods in some of their processes. The reuse measures offered opportunities for additional reductions not specifically prescribed in the RCM section for semiconductors. Future iterations of the Audit Protocol might be modified to have all semiconductor companies consider these measures.

IV-B4 Rinsewater Reduction RCMs for the Semiconductor Industry

Measures in this subsection focussed on rinsewater reduction methods specific to the semiconductor industry and similar industries. Both semiconductor and disk/head manufacturing participants completed this section. As with the previous section, participants segregated their manufacturing into discreet processes in different ways. This complicates the direct comparison of the degree to which various measures have been employed.

The measures did, however, reveal opportunities for additional reductions. Most measures rated as widely existing. For companies not employing those measures, the more prevalent concerns included water quality and the cost of replacement or retrofit for older process lines. A few specifically noted a commitment to include these measures as lines are replaced. Four companies cited idle flow reduction as an opportunity for savings. Wet benches with built-in recycling are currently used in only four of the participants' facilities, but another four indicate that they will continue research on the feasibility of this measure, particularly for equipment replacement.

IV-B5 Potential Cost-effective Flow Reduction Measures

This subsection included non-traditional approaches to water efficiency. Though considered effective for flow reduction, it was likely that these measures would be found more costly, more maintenance intensive, and/or effective for small flows only. Nevertheless, it was important to include these measures for evaluation to identify potential RCMs for use in the future.

Measures in this subsection begin with various methodologies for cooling tower efficiency. Treatment alternatives for facilitating water recycling are also included. Evaluation of these measures was required for all participants to the extent that they pertained to their type of business.

Cooling tower measures received mixed reviews. While seven companies have some sidestream filtration existing, only two are using ozonation. For companies rating ozonation as not applicable, there was a strong theme of concern over the ability of this measure to garner reductions and protect the effective life of the equipment. For those in the SBWR service area, concerns about using that water in cooling towers included decreased cycles, increased maintenance, and inadequate water quality. A few did note water softening as feasible for additional cooling tower efficiencies. Additional training and technical information may support further implementation of cooling tower efficiency measures.

The other measures in this section related to methods of treating wastewater for reuse or increasing the performance of pretreatment units for ultra-pure water applications. Many companies mistakenly evaluated these measures only as treatment methods for use of city water in ultra-pure water applications. Overall, only one company each noted the measure as applicable for reverse osmosis, electrodeionization, and high efficiency reverse osmosis.

IV-C Identified Projects

After assessing the applicability of measures to their facility, participants evaluated prospective measures (those noted as "applicable") for flow reduction and cost feasibility. The analysis included capital costs and pre- and post-project operating costs. The net operating costs were used as the annual benefit to calculate a simple payback period.

Certain aspects of how the projects were reported make a thorough analysis difficult. Participants were allowed at their discretion to include projects that had already been completed during the study period but prior to the submission of the Audit. Projects that featured the use of SBWR water in lieu of potable water did not generally result in a reduction in flow to the sanitary sewer and so have no net flow shown in the analysis. Still, such projects decrease the flow to the Bay and are thus beneficial. Several other

projects had no or incomplete cost analyses and hence show a payback of zero or no years.

Appendix E lists all the projects identified. As shown in the table below, 154 projects were identified overall. Of those, 51 projects were noted as having a payback of less than five years. With complete implementation, these projects represent a flow reduction of nearly 1 mgd. Several other projects had no or incomplete cost analyses and so currently show a payback of zero or no years. Additional projects with acceptable payback periods might arise from measures noted as "applicable" but not listed in the *Projects* section of the Audit. Some projects with a payback greater than five may be made cost-effective with additional analysis and/or financial incentives.

TABLE 4. PROJECT FLOW SUMMARY

	Total Flow Reduction (gpd)	# Projects
All Projects	3,515,125	154
Projects with <5 Year Payback	952,929	51
Completed Projects	669,693	36

V NEXT STEPS

The next steps of this program will consist of two parallel efforts. The first is working with the facilities that have completed their studies to continue evaluation of measures as needed and to implement projects identified in the Audits. The second is pursuing other companies - existing and new - that meet the 100,000-gpd criteria based on post-1997 data.

V-A Completed Audits

The purpose of the Audit was to identify feasible opportunities for flow reduction amongst the Plant's largest dischargers. Completion of the first phase of the Audit program now shifts the emphasis from evaluation to implementation. Fortunately, some companies have already begun implementing process and equipment changes concurrent with the Audit program.

While still employing a voluntary approach, the City will promote implementation of the projects through the Water Efficient Technologies program that offers financial incentives for companies to use toward completing their flow reduction projects. The City will continue to maintain commitment to stakeholder partnership by coordinating future efforts with the Silicon Valley Manufacturing Group and the Silicon Valley/San Jose Chamber of Commerce.

The City will be further evaluating the project matrices in Appendix D and comparing responses from various companies. This step is intended to provide greater insights into why companies evaluated measures as they did. It may well result in additional information being shared with companies and additional projects identified. Smaller group forums may also be warranted. Where feasible, technology-specific information will be compiled and presented to foster information sharing.

The City will continue to track progress on the implementation of flow reduction projects and the savings garnered.

V-B New Audits/Studies

The Flow Audit Study program is expected to be an ongoing element of the City's flow reduction efforts hereafter. Implementation of the next phase of audits might include:

1. Revising the Audit Protocol

The City will solicit feedback from participating companies and program staff to evaluate the Protocol, with an aim to streamline the process and improve the effectiveness of such audits for both the City and the participating companies. This feedback will facilitate assessment of the prescribed measures, identify new measures, and make suggestions to enhance the quality and impact of the process and of the Protocol. The electronic version of the Protocol will also be updated.

2. Identifying new Dischargers

Using post-1997 data, the City will identify additional participants - existing and new - for the Audit program. Once again, both water retailer and industrial user information will be accessed to assemble the list.

3. Improving Information Collection and Review

The City has developed a method for collecting and compiling flow reduction information as an outcome of the first phase of the Audit program. The next phase provides an opportunity to expedite information collection and offer a more efficient analysis of the Audits. Not only will this strategy improve collaboration between the City and the participants, but it will also maximize opportunities for successful flow reduction.

V-C The Clean Bay Strategy

The Flow Audit Study is one of many projects the City is pursuing in its effort to reduce flow to the South Bay. Other activities include projects such as water-conserving fixtures and equipment and Ultra Low Flush Toilets in the residential and commercial sectors. The SBWR program diverts effluent from the Plant for beneficial uses in landscape irrigation and industrial processes. The City is also conducting research studies related to streamflow augmentation and wetland creation, using SBWR water from the SBWR. The City reports on the status of all these flow reduction strategies in the *Clean Bay Strategy* report semiannually. For an update on these activities, please visit our web site http://www.ci.san-jose.ca.us/esd/.

VI APPENDICES

Appendix A: List of Flow Audit Study Participants

Appendix B: Full Audit Profile by Company

Appendix C: Audit Measures Matrices

Appendix D: Comparison of Company Responses by Measure

Appendix E: Flow Audit Study Projects Summary

Appendix A: List of Flow Audit Study Participants

List of Flow Audit Study Participants

Company Name	Permit #	Company Type		Review Status
Analog Devices, PMI Division		SC-060A	Semiconductor	Complete for Phase I Review
California Paperboard Corp.		SC-005C	Oth Ind: Paperboard	Complete for Phase I Review
Doubletree Hotel		SJ-DOUB	Comm: Hotel	Complete for Phase I Review
Dynamic Details		MI-014A	PCB Manufacturer	Complete for Phase I Review
Exchange Linen Services		SJ-022C	Oth Ind: Laundry	Complete for Phase I Review
Fairmont Hotel		SJ-FAIR	Comm: Hotel	Complete for Phase I Review
Good Samaritan Hospital		SJ-GOOD	Inst: Hospital	Complete for Phase I Review
HADCO		SC-027A	PCB Manufacturer	Complete for Phase I Review
Hewlett Packard		SJ-003A	Semiconductor	Complete for Phase I Review
IBM Corporation		SJ-007A	Disk/Head Mfr	Complete for Phase I Review
Intel Corporation D2P3		SC-249A	Semiconductor	Complete for Phase I Review
Intel Corporation, D2		SC-028A	Semiconductor	Complete for Phase I Review
Jefferson Smurfit		SC-003C	Oth Ind: Paperboard	Complete for Phase I Review
Komag Inc. Bldg 10		SJ-341A	Disk/Head Mfr	Complete for Phase I Review
Linear Technology		MI-006A	Semiconductor	Complete for Phase I Review
Lockheed Martin Fairchild Systems		MI-072A	Semiconductor	Complete for Phase I Review
LSI Logic		SC-046A	Semiconductor	Complete for Phase I Review
Micrel Inc.		SJ-258A	Semiconductor	Complete for Phase I Review
Paramount Great America		SC-PARA	Comm: Theme Park	Complete for Phase I Review
Read-Rite Corp.		MI-004A	Disk/Head Mfr	Complete for Phase I Review
San Jose Medical Center		SJ-SJME	Inst: Hospital	Complete for Phase I Review
San Jose State University		SJ-SJSU	Inst: Educational	Complete for Phase I Review
Sanmina Corp. Plant I		SJ-022A	PCB Manufacturer	Complete for Phase I Review
Sanmina Corp. Plant II		SJ-043A	PCB Manufacturer	Complete for Phase I Review
Santa Clara County, Elmwood Correctional Facility		MI-ELMW	Inst: Correctional	Complete for Phase I Review
Santa Clara County, Main County Jail		SJ-MAIN	Inst: Correctional	Complete for Phase I Review
Santa Clara University		SC-UNIV	Inst: Educational	Complete for Phase I Review
Santa Clara Valley Medical Center		SJ-SCVM	Inst: Hospital	Complete for Phase I Review
Seagate Technology		MI-061A	Semiconductor	Complete for Phase I Review
Sorrento Cheese Co.		SJ-016C	Oth Ind: Food Processing	Complete for Phase I Review
Unisil		SC-236A	Semiconductor	Complete for Phase I Review
UniSil Corp.		SC-295A	Semiconductor	Complete for Phase I Review
Vishay - Siliconix, Inc.		SC-033A	Semiconductor	Complete for Phase I Review
Cypress Semiconductor		SJ-024A		Exempt - Flows < 100K
Hewlett Packard		SC-052B		Exempt - Flows < 100K
O'Connor Hospital		SJ-OCON		Exempt - Flows < 100K
Akashic Memories		SJ-048A		Exempt - Shut Down
AMC Substrates		MI-008A		Exempt - Shut Down

Company Name	Permit #	Company Type		Review Status
AMC Substrates		MI-024A		Exempt - Shut Down
Del Monte Corporation #3		SJ-016A		Exempt - Shut Down
Integrated Device Technology (IDT)		SJ-047A		Exempt - Shut Down
Ionics		WV-001A		Exempt - Shut Down
Komag Inc.		SJ-266A		Exempt - Shut Down
Komag Inc.Bldg 9		SJ-340A		Exempt - Shut Down
Komag, Bld 2		MI-012A		Exempt - Shut Down
Komag, Bld 4		MI-013A		Exempt - Shut Down
MagePOWER Semiconductor Corp.		SJ-361A		Exempt - Shut Down
Micro Module Systems		CU-017A		Exempt - Shut Down
National Semiconductor		SC-020A		Exempt - Shut Down
Seagate Technology		MI-062A	Semiconductor	Exempt - Shut Down
StorMedia		SC-244A		Exempt - Shut Down
Valley View Packing		2-001C		Exempt - Shut Down
Western Digital		SC-169A		Exempt - Shut Down
Xicor, Inc.		MI-005A	Semiconductor	Exempt - Shut Down
Integrated Circuit Works		SJ-200A		Exempt - Sold
VLSI Technology, Inc.		SJ-021A		Exempt - Sold
Maxim Integrated Products, Inc.		SJ-369B		Hold - Pending Facility Expansion

Appendix B: Full Audit Profile by Company

Analog Devices, PMI Division

SC-060A Semiconductor

1997 Flows (gpd)	127,582	Permitted Industrial Discharge
1999 Flows (gpd)	93,718	Permitted Industrial Discharge

The study submitted had some deficiencies that were, for the most part, resolved by the inspector, although no manufacturing details were provided. Analog Devices currently reuses RO reject and cooling tower blowdown water as make-up water in their scrubbers and again in the cooling towers. The two projects scheduled for implementation involved upgrading their DI water system and increasing the capacity of their reclaim system holding tank. The projects were estimated to have water savings of approximately 30,000 gpd.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Upgrade DI Water System	22,777	$251,327	$96,574	2.66	4/18/99		☑
2	Increase Capacity of Reclaim Water Holding Tank	7,280	$9,000	$3,800	2.37	4/15/99		☑

Total for All Projects	**30,057**	*gpd*
Total for <5 Year Payback	**30,057**	*gpd*
Total for Completed Projects	**30,057**	*gpd*

Analog Devices, PMI Division

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	A	59 toilets/urinals can be replaced with ULFTs, not scheduled in Worksheet 7
4A-IB Aerators Retrofit	A	30 can be retrofitted, not scheduled in Worksheet 7
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	
4A-IIB SBWR for Irrigation	N	If they could get connected, SBWR currently not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	Don't have equipment to treat acid waste contaminated water for reuse.
4A-IVA Process Wastewater for Pumps	N	Don't have equipment to treat acid waste contaminated water for reuse.
4A-IVB SBWR for Pumps	N	No SBWR water at this site.
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	A	Not scheduled in Worksheet 7
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Not feasible at the present.
4B-IIA Maximize Cycles of Concentration	N	Cannot use greater than 5. Need this for blowdown reuse. Using 4 COCs now.
4B-IIB Reuse RO Reject or Process Wastewater	N	Use RO reject in the scrubbers.
4B-IIIA Reuse Scrubber Wastewater	N	We cannot. This goes to the AWN.
4B-IIIB Reuse Process Wastewater	A	Probably in the future.
4B-IIIC SBWR for Scrubbers	N	Would use as make-up water, but no SBWR at this site.
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	E	Wafer Fab
4C-IB Counter Current Rinses	N	Wafer Fab wrong type of system. No space.
4C-IC Spray Rinse Systems	E	Wafer Fab
4C-ID Spray Rinse/Evap Makeup Sytems	X	Not applicable for our type of manufacturing.
4C-IE Oversprays/Foggers	X	Not applicable for our type of manufacturing.
4C-IF Sensor Activated Rinses	E	Wafer Fab
4C-IG Timer Flow Controls	E	Wafer Fab
4C-IH Conductivity Flow Controls	E	Wafer Fab
4C-IIA Use in Scrubbers/Cooling Towers	A	Wafer Fab, no treated wastewater is used on site.
4C-IIB Reuse Process Rinsewater	A	Wafer Fab, installed system to treat rinse water for reuse.
4C-IIC Reuse of Treated Wastewater	N	Wafer Fab, no treated wastewater is used on site.
4C-IIIA Mechanical Mixers	N	Wafer Fab, due to contamination and space limitations.
4C-IIIB Air Agitation	E	Wafer Fab
4C-IIIC Sonics	E	Wafer Fab
4C-IIID Tank Arrangement	E	Wafer Fab
4C-IIIE Workpiece Agitation	E	Wafer Fab
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	N	Not in wafer fab, have done studies and the results are that this cannot be done.
4D-IB Hot Ultra Pure	A	In wafer fab, needs further study.
4D-IC Megasonic Rinsing	A	In wafer fab needs further review with process engineering.
4D-ID Spin Rinsing	E	In wafer Fab
4D-IE Rinse Tank Geometry	N	Not in wafer fab, 2 boat 4" setup, optimized now.
4D-IF Idle Flow Reduction	E	In wafer fab, need to continue monitoring existing set-up.
4D-II Wet Benches with Built-In Recycling	A	Could be implemented in certain areas. Easy to recycle the whole wafer fab water.
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	
5A-IB Ozonation	N	
5A-IC SBWR for Cooling Towers	N	SBWR not available, if could get connected, would use.
5A-ID Replace with Mechanical Cooling	N	Mechanical cooling cannot be used for the chillers.
5A-IE Softening	N	Our water treatment system is sufficient.
5A-II Reverse Osmosis	E	Recently replaced our old 1-stage RO unit with a 2-stage unit on 4/1/99.
5A-III High Efficiency RO	N	Did not understand for process reuse
5A-IV Ion Exchange	N	Did not understand for process reuse
5A-V Electrodeionization (EDI)	N	To be reviewed in near future.
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

California Paperboard Corp.

SC-005C Other Industrial: Paberboard

1997 Flows (gpd) 281,307 Permitted Industrial Discharge
1999 Flows (gpd) 466,298 Permitted Industrial Discharge

The study submitted was complete and gave very good detail to the manufacturing process. California Paperboard has completed several projects in the past two years, which were mentioned but not detailed in the Audit. One was the implementation of a "water loop" that improved the efficiency of their Hydrocal Disolved Air Flotation, reducing solids to the sanitary sewer by fifty percent, therefore reducing their loading to the Plant. This project was necessary to pave the way for the potential reuse of this water in other areas. California Paperboard has an on-going program to replace old water sealed pumps with water-less "pumpable" packing. Estimated water savings for this project when complete were 46,080 gpd. Another project identified was the installation of a Rossilator self-purging shower system for #1 paper machine felts. This project had not been approved at the time of the Audit submittal, but had potential water savings of 28,800 gpd. Since the audit was submitted, California Paperboard has purchased four Rossilator self-purging shower systems and has installed one on their #2 paper line. California Paperboard experienced difficulty with reusing industrial wastewater (e.g. plugging and bacterial growth) on the #2 paper line and has had to resort to using potable water until they can re-engineer the system to work with recycled water. They were continuing to try to resolve the issues and return to using their industrial wastewater before installing the other Rossilator systems on their remaining process lines (e.g. project #1). Because of the learning curve with the new Rossilator system, Cal Paperboard has experienced an increase in potable water use and industrial wastewater discharge.

California Paperboard began using SBWR water in their industrial process in 1998 and continues to use SBWR water at an average rate of 45 gpm - 75 gpm.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
	Water loop Project	0	$60,000	$0	0.00		Reduced solids discharging to the sewer by 50%, flow and cost not included	☑
	Inspection and Maintenance	20,000	$0	$0	0.00	6/3/99		☑
	Purple Water Project (for processes)	0	$0	$0	0.00	TBD	Gradually increasing use	☑
1	Install Rossilator self purging shower systems	28,800	$92,300	$16,800	5.49			☐
2	Pumpable Packing (no water used)	46,080	$46,800	$26,880	1.74	9/2001		☐
IC	Replace showerheads with low flow fixtures	250	$0	$0	0.00	TBD	Not included in project summary	☐
IIB	SBWR for irrigation	200	$0	$0	0.00	TBD	Not included in project summary	☐
IIIA	Replace with mechanical seals	125	$0	$0	0.00	TBD	Not included in project summary	☐
VA	Use of Statistical Process Control	0	$0	$0	0.00	TBD	Not included in project summary	☐

Total for All Projects **95,455** ***gpd***
Total for <5 Year Payback **46,080** ***gpd***
Total for Completed Projects **20,000** ***gpd***

California Paperboard Corp.

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	A	
4A-IIA Process Wastewater for Irrigation	N	High conductivity
4A-IIB SBWR for Irrigation	A	
4A-IIIA Mechanical Seals	A	Project replacing pumps w/ pumpable packing applicable/ Replacing mech seals not eval
4A-IIIB Process Wastewater for Seals	N	To high in solids and temperature
4A-IVA Process Wastewater for Pumps	E	
4A-IVB SBWR for Pumps	N	Already use process water
4A-VA Statistical Process Control	A	Project not evaluated or scheduled
4A-VB Inspection/Maintenance	E,A	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boilers
4B-IIA Maximize Cycles of Concentration	N	No cooling towers
4B-IIB Reuse RO Reject or Process Wastewater	N	No cooling towers
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	No cooling towers
5A-IB Ozonation	N	No cooling towers
5A-IC SBWR for Cooling Towers	N	No cooling towers
5A-ID Replace with Mechanical Cooling	N	No cooling towers
5A-IE Softening	N	No cooling towers
5A-II Reverse Osmosis	N	Does not apply to paper board manufacturing; already reusing 1000 gpm w/o treatment sy
5A-III High Efficiency RO	N	Does not apply to paper board manufacturing
5A-IV Ion Exchange	X	Not applicable technology for paperboard reuse
5A-V Electrodeionization (EDI)	X	Not applicable technology for paperboard reuse

Additional Measures Assessed (if any)

Cooling water for gearboxes

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Doubletree Hotel

SJ-DOUB Commercial: Hotel

1997 Flows (gpd)	139,782	Annual Water Consumption (SSUC Data)
1999 Flows (gpd)	107,368	Annual Water Consumption (SSUC Data)

Located just beyond the San Jose International Airport, the Doubletree Hotel includes 510 guest rooms and several conference facilities. At the outset of Audit coordination meetings, the Doubletree had just completed a renovation of half their guest rooms, with all fixtures being replaced except the toilets, which remained as 3.5 gallon-per-flush units. During the Audit, phase II of the renovation commenced with all fixtures including toilets being replaced with water saving models. The Doubletree had in the past made modifications to their laundry facilities and ice machines to maximize water efficiency. Most recently, they also remodeled the frequently used public area restrooms with ULFTs and automatic faucets.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	ULFTs in Public Area	3,800	$26,100	$6,200	4.21	03/00		☐
2	Increase CT cycles	2,901	$50,000	($3,666)	-13.64		Negative payback; Not scheduled	☐
3	ULFTs in Guest Rooms (2nd Half)	2,975	$92,055	$4,727	19.47		Not scheduled. Completed retrofit of half of guest room units 3/00.	☐
Total for All Projects		**9,676**	***gpd***					
Total for <5 Year Payback		**3,800**	***gpd***					
Total for Completed Projects			***gpd***					

Doubletree Hotel

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E,>5,A	1/2 of guestroom units replaced in '99. 2nd half not scheduled & public areas not schedul
4A-IB Aerators Retrofit	E	Faucets have aerators
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	No process water
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	No process water
4A-IVA Process Wastewater for Pumps	N	No process water
4A-IVB SBWR for Pumps	N	SBWR not available
4A-VA Statistical Process Control	N	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No process water
4B-IIA Maximize Cycles of Concentration	>5	
4B-IIB Reuse RO Reject or Process Wastewater	N	No process water or RO
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	E	
5A-IB Ozonation	N	
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	N	
5A-IE Softening	E	Installed in 1995 - Cost = $50K
5A-II Reverse Osmosis	X	
5A-III High Efficiency RO	X	
5A-IV Ion Exchange	X	
5A-V Electrodeionization (EDI)	X	
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Dynamic Details

MI-014A Printed Circuit Board Manufacturer

1997 Flows (gpd)	95,130	Permitted Industrial Discharge
1999 Flows (gpd)	147,058	Permitted Industrial Discharge

Dynamic Details is a circuit board shop whose production includes significant prototype work. Their original submission was on time but required some modification and additional information on the various steps in their manufacturing. The company has experienced tremendous growth over the last four years and has used every opportunity to upgrade equipment to include water saving features. They installed an automated Cuposit line and an automated DES line that featured sensor-controlled rinses and ion exchange to facilitate reuse. It was estimated that such technologies were saving more than 40,000 gpd. During the course of the Audit, they also retrofitted the restrooms with ULFTs and placed additional controls on the copper plating line to increase water savings. They were also moving forward on integrating Reverse Osmosis technology for reuse into their facility, having purchased an RO unit and contracted with a service provider for system design. Should this project prove feasible, it could result in the reuse of more than 40,000 gpd.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Bathroom modifications	1,975	$1,650	$2,739	0.60	5/13/99	Completed	☑
2	Installing RO for to reuse process water for rinsing	43,200	$74,950	$28,697	2.72	12/31/00		☐
3	Black Oxide/Multibond Automated Line	3,726	$200,000	$2,450	81.63	N/A		☐
4	Copper Electro Plating - Flow Controls	2,880	$1,250	$1,900	0.66	2/10/00		☑

Total for All Projects	**51,781**	***gpd***
Total for <5 Year Payback	**48,055**	***gpd***
Total for Completed Projects	**4,855**	***gpd***

Dynamic Details

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	A	
4A-IB Aerators Retrofit	A	
4A-IC Showerhead Replacement	N	Have only emergency showers
4A-IIA Process Wastewater for Irrigation	N	
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	N	
4A-IIIB Process Wastewater for Seals	N	Would affect life of pumps
4A-IVA Process Wastewater for Pumps	N	None existing
4A-IVB SBWR for Pumps	N	SBWR not available
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boiler
4B-IIA Maximize Cycles of Concentration	E	Closed loop
4B-IIB Reuse RO Reject or Process Wastewater	N	Towers are closed loop
4B-IIIA Reuse Scrubber Wastewater	N	Very small unit, to many contaminents
4B-IIIB Reuse Process Wastewater	E	Using membrane water instead, too many contaminents in process water
4B-IIIC SBWR for Scrubbers	N	SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	E,N	Not in Fab 3, 5, closed loop, pressure washer used
4C-IB Counter Current Rinses	E,N	Not in Fab 3, 4-2,4-3, 5,6,7-1,7-7 closed loop, conveyor process
4C-IC Spray Rinse Systems	E,N	Not in Fab 1,3,7-1,7-3,7-4,7-6, 7-7 rinse quality.closed loop
4C-ID Spray Rinse/Evap Makeup Sytems	E,N	Not in Fab 1,3,5,7-1,7-3,7-4,7-6,7-3 rinse quality,closed loop
4C-IE Oversprays/Foggers	N	Poor rinse quality; conveyorized process, closed loop
4C-IF Sensor Activated Rinses	E, N,A	Appl. in Fab 7-2, Exist in Fab 2, 4-1, 7-5, 7-7, NA already optimized, rinse quality; too delic
4C-IG Timer Flow Controls	E,N,A	Appl. in Fab 7-2, Existing in Fab 7-7, NA optimized; rinse quality; delicate process
4C-IH Conductivity Flow Controls	N	Optimized, rinse quality; delicate process; too much fluctuation
4C-IIA Use in Scrubbers/Cooling Towers	N	Needs pretreatment
4C-IIB Reuse Process Rinsewater	E,N	Not in Fab 5,6,7-1,7-3, 7-4, cyanide destruct
4C-IIC Reuse of Treated Wastewater	E,N	Not in Fab 5, 7-3,7-4
4C-IIIA Mechanical Mixers	E, N	Only existing in 7-4,7-6 NA No need, automated line; affects Process
4C-IIIB Air Agitation	N,A,E	Only Applicable in Fab 1, Exist in Fab 7-7 NA automated line, rinse quality
4C-IIIC Sonics	N	No need, automated line
4C-IIID Tank Arrangement	E,N	Not in Fab 3,4-3, 5 closed loop
4C-IIIE Workpiece Agitation	N,A,E	Applicable in Fab 1, Existing in 7-6,7-7 NA Automated line; Done manually
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Closed Loop
5A-IB Ozonation	N	
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	N	Need for more power
5A-IE Softening	N	Not economical
5A-II Reverse Osmosis	A	
5A-III High Efficiency RO	N	no need for UPW
5A-IV Ion Exchange	E	
5A-V Electrodeionization (EDI)	N	No need
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Exchange Linen Services

SJ-022C Other Industrial: Laundry

1997 Flows (gpd) 117,063 Permitted Industrial Discharge
1999 Flows (gpd) 120,465 Permitted Industrial Discharge

Exchange Linen Service submitted a complete study in June 1999. They did a good job detailing water use at the facility and committed to the implementation of three flow reduction/water reuse projects with an estimated water savings of at least 45,000 gallons per day. The largest recycling project was the additional treatment and reuse of wastewater from the dissolved air flotation treatment process back into the washing process. Another project involved the 100% recycling of extractor coolant water to the cold water tank. The company had also committed to the continuation of replacing older toilets, urinals, faucets and shower heads to ultra low flow fixtures.

Overall, this Audit was well done and showed a good faith effort in finding process water efficiencies. The projects are scheduled for completion by the end of 2001.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Recycle treated wastewater (DAF) to washing process	46,045	$142,796	$42,893	3.33	11/2001		☐
1A	Retrofit toilets and urinals	344	$0	$0	0.00	4/2000	No cost data provided	☐
1B	Retrofit faucets with aerators	79	$0	$0	0.00	3/2000	No cost data provided	☐
1C	Retrofit shower	6	$0	$0	0.00	3/2000	No cost data provided	☐
2	Recycle extractor coolant water	1,000	$1,739	$2,979	0.58	5/2000		☐

Total for All Projects **47,474** ***gpd***
Total for <5 Year Payback **47,045** ***gpd***
Total for Completed Projects ***gpd***

Exchange Linen Services

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E,A	5 existing, 11 applicable
4A-IB Aerators Retrofit	E,A	one existing 12 applicable
4A-IC Showerhead Replacement	A	
4A-IIA Process Wastewater for Irrigation	N	No water used for irrigation
4A-IIB SBWR for Irrigation	N	No water used for irrigation
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	All seals mechanical
4A-IVA Process Wastewater for Pumps	N	Negligible flow use (125 gpd)
4A-IVB SBWR for Pumps	N	Negligible flow use (125 gpd)
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Detergent Residue high
4B-IIA Maximize Cycles of Concentration	N	No cooling towers
4B-IIB Reuse RO Reject or Process Wastewater	N	No cooling towers
4B-IIIA Reuse Scrubber Wastewater	E	Water for lint traps currently recycled
4B-IIIB Reuse Process Wastewater	N	Already reusing scrubber wastewater
4B-IIIC SBWR for Scrubbers	N	Already reusing scrubber wastewater
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	No cooling towers
5A-IB Ozonation	N	No cooling towers
5A-IC SBWR for Cooling Towers	N	No cooling towers
5A-ID Replace with Mechanical Cooling	N	No cooling towers
5A-IE Softening	N	No cooling towers
5A-II Reverse Osmosis	X	Reuse of wastewater can be accomplished with existing equipmen, not applicable to laun
5A-III High Efficiency RO	X	Not applicable to laundry
5A-IV Ion Exchange	X	Not applicable to laundry
5A-V Electrodeionization (EDI)	X	Not applicable to laundry

Additional Measures Assessed (if any)

Recycle treated wastewater to washing process
Recycling of extractor coolant water to cold water tank

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Fairmont Hotel

SJ-FAIR Commercial: Hotel

1997 Flows (gpd)	147,942	Annual Water Consumption (SSUC)
1999 Flows (gpd)	141,870	Annual Water Consumption (SSUC)

The Fairmont is a 544-room, luxury hotel in the heart of downtown San Jose. Their clientele is largely a business audience; thus their occupancy, while high, generally includes only one person per room.

While their Audit study was submitted on time, it was largely incomplete. Completed information was made available with additional requests. With only "industry average" information available, it was difficult to assess project payback at this site; guest room usage was estimated at 77,000 gpd but what part of that is attributable to toilet use greatly impacts whether replacement of their 3.5 gpf toilets is a cost-effective project. The project was determined to have a project payback of 20 years. The only project determined to be cost effective was the use of water softening to increase the cycles of concentration on the cooling towers. This would result in savings of approximately 4,000 gpd and was slated to be considered by management for completion in 2001. In the last year Fairmont merged with a Canadian hotel chain that has a comprehensive environmental program. Expansion of that effort to the local site may result in additional water saving projects.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	ULFTs and Urinals	4,577	$159,694	$7,457	21.42	N/A		☐
2	Cooling Tower Water Softeners	6,956	$12,410	$6,387	1.94	2001	Need Owner's Approval	☐

Total for All Projects	**11,533**	***gpd***
Total for <5 Year Payback	**6,956**	***gpd***
Total for Completed Projects		***gpd***

Fairmont Hotel

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	606 Units
4A-IB Aerators Retrofit	E	576 guest faucet aerators installed
4A-IC Showerhead Replacement	E	547 guest and employee locker room low flow shower heads installed
4A-IIA Process Wastewater for Irrigation	N	No process water
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	Pumps have mechancial seals
4A-IVA Process Wastewater for Pumps	N	Pumps have mechancial seals
4A-IVB SBWR for Pumps	N	Pumps have mechancial seals, SBWR not available
4A-VA Statistical Process Control	N	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No process water
4B-IIA Maximize Cycles of Concentration	A	Not evaluated or scheduled in Worksheets 5 - 7
4B-IIB Reuse RO Reject or Process Wastewater	N	No process water
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers, SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	
5A-IB Ozonation	N	Tried this before; not effective
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	N	
5A-IE Softening	A	Review for operation
5A-II Reverse Osmosis	X	
5A-III High Efficiency RO	X	
5A-IV Ion Exchange	X	
5A-V Electrodeionization (EDI)	X	
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Good Samaritan Hospital

SJ-GOOD Institutional: Hospital

1997 Flows (gpd)	117,189	Reported in FAS. Need Water Co Info
1999 Flows (gpd)	117,189	Reported in FAS. Need Water Co Info

The study submitted had minor deficiencies that were resolved after a comment letter was sent. This facility replaced one of its cooling towers in 1999 to a more efficient system, exceeding our minimum reasonable control measure of 5 cycles of concentration and reducing the discharge from the unit by 55 percent. This hospital was strongly opposed to installing ultra low flush toilets due to an unsuccessful pilot of these toilets approximately 10 years ago. They were also opposed to installing low flow showerheads and faucets. Staff committed to continuing to work with the hospital representatives to try to provide information to help them realize greater potential domestic water use efficiencies in the future.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
	Replace Cooling Tower for More Efficient Model	0	$0	$0	0.00	4/99	no cost or flow data provided	☑

Total for All Projects	**0**	*gpd*
Total for <5 Year Payback		*gpd*
Total for Completed Projects	**0**	*gpd*

Good Samaritan Hospital

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	N	Have tried, did not work
4A-IB Aerators Retrofit	N	Have tried, did not work
4A-IC Showerhead Replacement	N	Have tried, did not work
4A-IIA Process Wastewater for Irrigation	N	No process water
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	>5	Deemed not cost effective, but no cost analysis was done in Worksheets 5B-5G
4A-IVA Process Wastewater for Pumps	N	Air cooled only
4A-IVB SBWR for Pumps	N	SBWR not available
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	E, A	Can use condenser water, not scheduled or evaluated in Worksheets 5-7
4B-IIA Maximize Cycles of Concentration	E,A	Will be also replacing cooling tower with more water effiencient model.
4B-IIB Reuse RO Reject or Process Wastewater	N	No process water
4B-IIIA Reuse Scrubber Wastewater	N	No scrubber
4B-IIIB Reuse Process Wastewater	N	No scrubber
4B-IIIC SBWR for Scrubbers	N	No scrubber
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Will be also replacing cooling tower with more water effiencient model.
5A-IB Ozonation	N	Will be also replacing cooling tower with more water effiencient model.
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	N	Cooling towers are more efficient
5A-IE Softening	E	Will be also replacing cooling tower with more water effiencient model.
5A-II Reverse Osmosis	X	
5A-III High Efficiency RO	X	
5A-IV Ion Exchange	X	
5A-V Electrodeionization (EDI)	X	

Additional Measures Assessed (if any)

Replace cooling tower with new 4 ton water efficient model

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

HADCO

SC-027A Printed Circuit Board Manufacturer

1997 Flows (gpd) 355,614 Permitted Industrial Discharge
1999 Flows (gpd) 463,318 Permitted Industrial Discharge

The study submitted had some deficiencies and several meetings were held to resolve the flow balance issues. Five projects were identified as applicable and four were scheduled for immediate implementation with estimated water savings of 39,000 gpd. Because of the increase in weighted average layer count (WALCO) in the products being manufactured at this site, (the increase in board layers requires additional rinsing and slower rinse times), HADCO has implemented a stringent in-house water auditing process. They continue to evaluate ways to reduce, reuse or recycle their wastewater in an effort to minimize their increase in water usage. Currently 40% of HADCO's processing water is reused on site.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	B-2 Line #2 Rinses retrofit Project	7,720	$895,685	$0	5.00	8/31/99	Payback was not calculated because not benefit given, but <5 year payback	☑
2	B-2 Line #3 rinses retrofit & developer rinse recycle project	10,600	$172,697	$0	5.00	11/30/99	Payback was not calculated because not benefit given, but < 5 year payback	☐
3	B-2 Line #4 rinses retrofit & developer project rinse water	10,600	$172,697	$0	5.00	11/30/99	Payback was not calculated because not benefit given, but < 5 year payback	☐
4	B-2 Line #5 rinses retrofit & developer project rinse water	10,600	$172,697	$0	5.00	11/30/99	Payback was not calculated because not benefit given, but <5 year payback	☐
5	Triple Rinse Drum wash station	6,281	$16,056	$0	0.00	TBD	No benefits or payback given	☐
NA	Employee Training	0	$0	$0	0.00	2/5/99	Not cost or flow data provided	☑
NA	Showerheads	0	$0	$0	0.00	3/1/99	Not cost or flow data provided	☑

Total for All Projects	**45,801**	*gpd*
Total for <5 Year Payback	**39,520**	*gpd*
Total for Completed Projects	**7,720**	*gpd*

HADCO

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	A	Already has low flow urinals, also may install sensor activated flushing (not scheduled)
4A-IB Aerators Retrofit	E	Considering installing sensor activated faucets
4A-IC Showerhead Replacement	A	
4A-IIA Process Wastewater for Irrigation	N	Wastewater is not compatible with water needs
4A-IIB SBWR for Irrigation	N	No SBWR water at this site, but interested when available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	Not close enough together
4A-IVA Process Wastewater for Pumps	E	
4A-IVB SBWR for Pumps	N	No SBWR water at this site, but interested when available
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	A	1765 employees attended water conservation training 2/99 & separate sessions for engin
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Process water too hard
4B-IIA Maximize Cycles of Concentration	N	No cooling towers
4B-IIB Reuse RO Reject or Process Wastewater	N	No cooling towers
4B-IIIA Reuse Scrubber Wastewater	E	
4B-IIIB Reuse Process Wastewater	N	Process water too hard
4B-IIIC SBWR for Scrubbers	N	No SBWR water at this site, but interested when available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	E,A	Applicable in B-2, DES lines 3,4,&5, C-1
4C-IB Counter Current Rinses	E,N	Not in ID# C-5 no rinse sump so no counter current rinse
4C-IC Spray Rinse Systems	E,N	Not in ID# B-1, C-1, C-2, C-3, C-4 not compatible to existing systems and product quality
4C-ID Spray Rinse/Evap Makeup Sytems	E,N	Not in ID# B-1,C-1,C-2,C-3, C-6 product quality, C-4 immersion only
4C-IE Oversprays/Foggers	N	Not used in any process since not compatible to existing systems and product quality
4C-IF Sensor Activated Rinses	E,N	Not in C-1, need constant overflow, C-4 cascade rinse no turnover
4C-IG Timer Flow Controls	E,N	Not in ID# B-2,C-3 sensor activated,C-1 constant overflow,C-2 manual C-4 cascade no tur
4C-IH Conductivity Flow Controls	E,A,N	Applicable in ID# B-2, Not in ID# C-5 cleanliness by filtration, Not in C-6 by proximity sens
4C-IIA Use in Scrubbers/Cooling Towers	N	Not used in any process due to lack of water quality
4C-IIB Reuse Process Rinsewater	E,N	ID# C-4 needs high quality rinse water
4C-IIC Reuse of Treated Wastewater	E,N	Not in ID# C-1, C-4 does not meet quality requirements for reuse
4C-IIIA Mechanical Mixers	N	Not in ID# B-1, B-2, C-1, C-2,C-3,C-4 line process and tank size and design incompatible
4C-IIIB Air Agitation	E,N	No in ID# B-2, C-3 quality problems, C-5 no rinse sump, C-6 other agitation measure used
4C-IIIC Sonics	N	Not used in any process since not compatible to existing systems and product quality
4C-IIID Tank Arrangement	E,A,N	Applicable in ID# B-1 (not scheduled). C-1 tank design incompatible, C-5 no rinse sump
4C-IIIE Workpiece Agitation	E,N	Not in ID# B-2 no agitation needed, Not in ID#C-3 product quality problems, C-4 manual
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	No cooling towers
5A-IB Ozonation	N	No cooling towers
5A-IC SBWR for Cooling Towers	N	No cooling towers, SBWR not available
5A-ID Replace with Mechanical Cooling	N	No cooling towers
5A-IE Softening	N	No cooling towers
5A-II Reverse Osmosis		Did not understand for reuse
5A-III High Efficiency RO	E	
5A-IV Ion Exchange		Did not understand for reuse
5A-V Electrodeionization (EDI)	N	Not compatible with existing treatment systems

Additional Measures Assessed (if any)

Triple rinse drum wash station

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Hewlett Packard

SJ-003A Semiconductor

1997 Flows (gpd) 306,448 Permitted Industrial Discharge
1999 Flows (gpd) 287,864 Permitted Industrial Discharge

Hewlett Packard Company (HP) required an extension to the original timeline; their final Audit submittal was received August 16, 1999. Minor adjustments were promptly made to satisfy all discrepancies. The site consisted of two manufacturing and one service building. The complex manufacturing processes were detailed to a level adequate to address the purposes of this study. All reported information was credible and well documented. Six of eight flow reduction projects were scheduled for implementation. Both RCMs and 4 other projects were on the implementation schedule. Two projects not scheduled for implementation did not meet the criteria as economically feasible for implementation. The quality of the project evaluation and documentation was appropriate for the study.

Since completing the study, HP's diversion of groundwater to the storm drain has been completed. They need to dewater their basement because of a high water table. That water had previously been discharged to the sanitary sewer system, but after pursuing the appropriate approvals, HP diverted that water to discharge directly to the storm sewer system. While this project does not result in a decrease in water used at the site, it does reduce flows to the sanitary sewer system by more than 40,000 gpd.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Domestic Flow Reduction (toilets and shower)	11,725	$0	$0	0.00	12/31/99	Cost data was left blank	☑
2	Move Bulk Storage Operation Overseas	18,720	$0	$0	0.00	04/23/99	Cost data was left blank	☑
3	Convert 4 Inch to 6 Inch Wafer Fab	45,000	$0	$0	0.00	12/31/00	Cost data was left blank	☐
4	DI Reclaim using EDI	36,000	$306,000	$127,810	2.39	01/01/02		☐
5	Divert Groundwater to Storm Drain	48,000	$5,000	$12,143	0.41	TBD		☑
6	Groundwater Reclaim Treatment for Facility Use	36,000	$425,000	($78,183)	-5.44			☐
7	Divert Liquid Ring Vacuum Pump Leak to Scrubber	2,400	$25,000	$971	25.75			☐
8	Idle flow rate reduction	1,000	$0	$0	0.00	11/01/99	Cost data was left blank	☐

Total for All Projects **198,845** ***gpd***
Total for <5 Year Payback **84,000** ***gpd***
Total for Completed Projects **78,445** ***gpd***

Hewlett Packard

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	A	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	A	
4A-IIA Process Wastewater for Irrigation	N	Reclaim water TDS (780 PPM) does not meet TDS quality specs (less than 500 PPM) res
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	Closed loop
4A-IVA Process Wastewater for Pumps	N	Reclaim exceeds TDS, hardness, or chloride water quality specs (<200,200,10 PPM) resp
4A-IVB SBWR for Pumps	N	SBWR not available
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Closed loop system
4B-IIA Maximize Cycles of Concentration	E	
4B-IIB Reuse RO Reject or Process Wastewater	N	Reclaim (TDS=780, Hardness=429, Conductivity 1010) exceeds quality specifications(40
4B-IIIA Reuse Scrubber Wastewater	N	High organic and TDS levels
4B-IIIB Reuse Process Wastewater	E,A	Project to reuse pump seal water into scrubbers
4B-IIIC SBWR for Scrubbers	N	SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	E	
4D-IB Hot Ultra Pure	E	
4D-IC Megasonic Rinsing	N	This type of rinsing jeopardizes the product quality and ergonomic health of workers
4D-ID Spin Rinsing	E	
4D-IE Rinse Tank Geometry	E,A	Project to convert 6"Fab to 4"
4D-IF Idle Flow Reduction	A	
4D-II Wet Benches with Built-In Recycling	N	Evaluated on a case by case basis by process engineers
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	E	
5A-IB Ozonation	N	Found to be ineffective and damaging after a trial period
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	E	
5A-IE Softening	E	
5A-II Reverse Osmosis		A high efficiency RO already exists (although not relevant), did not understand for reuse
5A-III High Efficiency RO		Did not understand for process reuse
5A-IV Ion Exchange		Did not understand for process reuse
5A-V Electrodeionization (EDI)	A	Project to recycle process water using EDI

Additional Measures Assessed (if any)

Move Bulk Storage Operation Overseas
Divert Groundwater to Storm Drain

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

IBM Corporation

SJ-007A Disk/Head Manufacturer

1997 Flows (gpd) 547,746 Permitted Industrial Discharge
1999 Flows (gpd) 481,637 Permitted Industrial Discharge

The study submitted was basically complete, however a letter was sent asking for clarification on a few items. All issues were quickly resolved. The flows and water usage were presented in detail with the exception of the manufacturing process, which was shown with no specific breakdown. Five projects were identified in the study which if implemented, could have an estimated flow reduction of 289,850 gpd. No projects were scheduled for implementation in the Audit, however the three projects which were considered Reasonable Control Measures (RCMs) are being investigated by their staff to ensure that there are no barriers with future implementation.

IBM has implemented significant flow reduction projects in the recent past, such as the construction of a segregated wastewater treatment plant which allows them to reuse approximately 50% of their process wastewater in their cooling towers. As part of their ISO 9001 and ISO 14001 programs, IBM has integrated the evaluation of water use reduction into product and process development cycles. They have converted many of their tools to the efficient spray rinse technology which has reduced the amount of water and chemicals used in the manufacturing process. IBM has made a commitment to continue to evaluate and implement cost-effective approaches to reducing water usage and sewer discharges at their facilities.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Reuse treated rinse water, CT blowdown & R.O. reject for	122,500	$1,985,970	$143,000	14.00			☐
1RCM	Install ULFTs	43,450	$0	$0	0.00			☐
2	Increase R.O. Feed water recovery.	109,500	$837,970	$85,000	10.00		Similar to second pass RO with ion exchange softener	☐
2RCM	Reuse treated wastewater for pump seals at Conc. Plant	7,200	$0	$0	0.00			☐
3RCM	Recycle vacuum pump seal water	7,200	$0	$0	0.00			☐
Total for All Projects		**289,850**	***gpd***					
Total for <5 Year Payback			***gpd***					
Total for Completed Projects			***gpd***					

IBM Corporation

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E,A	Not scheduled or evaluated in Worksheets 5-7
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	>5	Rinse plant effluent already reused.elsewhere in other processes
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	E	IBM installs mechanical seals for non-abrasive water and wastewater
4A-IIIB Process Wastewater for Seals	A	Reuse treated wastewater in pumps in the concentrate wastewater treatment plant
4A-IVA Process Wastewater for Pumps	E,A	Existing at one of two pumps, recycle pump water project not scheduled or evaluated
4A-IVB SBWR for Pumps	N	SBWR not available
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Wafer Fab rinse plant effluent is used to capacity in cooling towers.
4B-IIA Maximize Cycles of Concentration	E	
4B-IIB Reuse RO Reject or Process Wastewater	E	
4B-IIIA Reuse Scrubber Wastewater	N	No reuse opportunities for scrubber wastewater.
4B-IIIB Reuse Process Wastewater	E	
4B-IIIC SBWR for Scrubbers	N	SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	E	In Wafer, Fab, Disk, and Assembly
4C-IB Counter Current Rinses	N,E	Not suited for Wafer, Fab, and Assembly, existing in Disks
4C-IC Spray Rinse Systems	E	In Wafer, Fab, Disk, and Assembly
4C-ID Spray Rinse/Evap Makeup Sytems	N	Not suited for either Wafer, Fab, Disk, Assembly
4C-IE Oversprays/Foggers	N	Not suited for either Wafer, Fab, Disk, Assembly
4C-IF Sensor Activated Rinses	E,N	In Wafer, Disks, Timer flow controls are used in Fab and Assembly
4C-IG Timer Flow Controls	E	In Wafer, Fab, Disk, and Assembly
4C-IH Conductivity Flow Controls	E	In Wafer, Fab, Disk, and Assembly
4C-IIA Use in Scrubbers/Cooling Towers	E	In Wafer, Fab, Disk, and Assembly
4C-IIB Reuse Process Rinsewater	N	Rinse waters from Wafer, Fab, Disk and Assembly are not of acceptable quality for reus
4C-IIC Reuse of Treated Wastewater	N	Treated wastewater is not acceptable quality for reuse
4C-IIIA Mechanical Mixers	N	Other rinse agitation measures are used in Wafer, Fab, Disk, and Assembly
4C-IIIB Air Agitation	N	Other rinse agitation measures are used in Wafer, Fab, Disk and Assembly
4C-IIIC Sonics	E	In Wafer, Fab, Disk, and Assembly
4C-IIID Tank Arrangement	E	In Wafer, Fab, Disk, and Assembly
4C-IIIE Workpiece Agitation	E	In Wafer, Fab, Disk, and Assembly
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	E	In Wafer, Fab, Disk, and Assembly
4D-IB Hot Ultra Pure	N	Other rinse reduction measures used.
4D-IC Megasonic Rinsing	E,N	In Wafer,Fab, not in Disk or Assembly
4D-ID Spin Rinsing	E,N	In Wafer,Fab, not in Disk or Assembly
4D-IE Rinse Tank Geometry	E,N	In Wafer,Fab, not in Disk or Assembly
4D-IF Idle Flow Reduction	E,N	In Wafer,Fab, not in Disk or Assembly
4D-II Wet Benches with Built-In Recycling	N	Not in Wafer, Fab, Disk or Assembly, other rinse reduction measures are used.
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Cooling tower uses treated rinse water which has low solids.
5A-IB Ozonation	N	Cooling tower already achieves high cycles of concentrations.
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	N	Because cooling tower uses treated rinse water, no discharge reduction would result.
5A-IE Softening	N	Cooling tower uses treated rinse water which has low hardness.
5A-II Reverse Osmosis	N,>5	Second pass RO with ion exchange softening pretreatment
5A-III High Efficiency RO	N	Additional recovery from RO reject is evaluated as a project.
5A-IV Ion Exchange	N,>5	Second pass RO with ion exchange softening pretreatment
5A-V Electrodeionization (EDI)	N	No application for EDI was identified for treating wastewater for reuse.

Additional Measures Assessed (if any)

Reuse pump seal water

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Intel Corporation D2P3

SC-249A Semiconductor

1997 Flows (gpd) 361,313 Permitted Industrial Discharge
1999 Flows (gpd) 375,429 Permitted Industrial Discharge

The flow audit study submitted was basically complete. The flows and water usage were presented in detail with the exception of the manufacturing process, which was shown with no specific breakdown. Some additional general manufacturing information was submitted later, but was done on theoretical bases, not from actual site measurements. Two types of projects were identified: the use of reverse osmosis reject water in the cooling towers and the improvement of pH controls for the scrubbers. These projects would reduce the amount of make-up water previously used by approximately 137,700 gpd at the D2P3 facility. Both projects were scheduled for implementation and have since been completed.

Although Intel did not give specific site details of their manufacturing processes, they have implemented many rinse efficiencies within their manufacturing process. They stated a commitment to incorporating the best available rinse technologies and where possible, rinse water segregation, as process lines were retooled. They are developing an industrial wastewater reuse program with the intention of recycling dilute rinsewater from their new P4 fab back into the industrial city water tank for use in cooling towers and/or scrubbers. Piloting of this system may begin by 2001.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Ro Reject to the Cooling Towers	65,754	$43,600	$71,686	0.61	6/30/99		☑
2	pH Control for Scrubbers	72,000	$236,590	$91,014	2.60	11/30/98		☑
3	SBWR recycled water for irrigation	0	$0	$0	0.00	TBD	Currently working with SBWR to connect	☐

Total for All Projects	**137,754**	*gpd*
Total for <5 Year Payback	**137,754**	*gpd*
Total for Completed Projects	**137,754**	*gpd*

Intel Corporation D2P3

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	Process water quality inadequate
4A-IIB SBWR for Irrigation	A	Working with SBWR to hookup
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	Process water quality inadequate
4A-IVA Process Wastewater for Pumps	N	Process water quality inadequate
4A-IVB SBWR for Pumps	N	SBWR recycled water quality inadequate
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Process water quality inadequate
4B-IIA Maximize Cycles of Concentration	N	Focused on reusing RO reject
4B-IIB Reuse RO Reject or Process Wastewater	A	RO reject in cooling towers
4B-IIIA Reuse Scrubber Wastewater	N	Scrubber discharge water quality inadequate
4B-IIIB Reuse Process Wastewater	N	Process water quality inadequate
4B-IIIC SBWR for Scrubbers	N	SBWR recycled water quality inadequate
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	E	
4D-IB Hot Ultra Pure	E	
4D-IC Megasonic Rinsing	E	
4D-ID Spin Rinsing	E	
4D-IE Rinse Tank Geometry	E	
4D-IF Idle Flow Reduction	E	
4D-II Wet Benches with Built-In Recycling	E	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Not feasible for D2P3 cooling towers
5A-IB Ozonation	N	Not feasible for D2P3 cooling towers
5A-IC SBWR for Cooling Towers	N	SBWR recycled water quality inadequate
5A-ID Replace with Mechanical Cooling	N	Not feasible for D2P3
5A-IE Softening	E	
5A-II Reverse Osmosis	N	Did not understand that this was for process reuse
5A-III High Efficiency RO	E	Did not understand that this was for process reuse
5A-IV Ion Exchange	N	Did not understand that this was for process reuse
5A-V Electrodeionization (EDI)	N	Did not understand that this was for process reuse

Additional Measures Assessed (if any)

pH Control of Scrubbers

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Intel Corporation, D2

SC-028A Semiconductor

1997 Flows (gpd) 293,359 Permitted Industrial Discharge
1999 Flows (gpd) 163,205 Permitted Industrial Discharge

The flow audit study submitted was basically complete. The flows and water usage were presented in detail with the exception of the manufacturing process, which was shown with no specific breakdown. Some additional general manufacturing information was submitted later, but was done on theoretical bases, not from actual site measurements. Two types of projects were identified: the use of reverse osmosis reject water in the cooling towers and the improvement of pH controls for the scrubbers. These projects would reduce the amount of make-up water previously used by approximately 160,000 gpd at the D2 (P1/P2) facility. Both projects were scheduled for implementation and have been completed.

Although Intel did not give specific site details of their manufacturing processes, they have implemented many rinse efficiencies within their fabs, particularly in the tape automated bonding operations. They stated a commitment to incorporating the best available rinse technologies and where possible, rinse water segregation, as process lines were retooled. They are developing an industrial wastewater reuse program with the intention of recycling dilute rinsewater from their new P4 fab back into the industrial city water tank for use in cooling towers and/or scrubbers. Piloting of this system may begin by 2001.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	RO Reject to the Cooling Towers	43,836	$29,067	$47,389	0.61	06/30/99		☑
2	pH Control for the Scrubbers Project	115,200	$157,723	$77,446	2.04	11/30/98		☑
3	SBWR recycled water for irrigation	0	$0	$0	0.00	TBD	Currently working with SBWR to connect	☐

Total for All Projects **159,036** ***gpd***
Total for <5 Year Payback **159,036** ***gpd***
Total for Completed Projects **159,036** ***gpd***

Intel Corporation, D2

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	Process water quality inadequate
4A-IIB SBWR for Irrigation	A	Working with SBWR for hookup
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	Process water quality inadequate
4A-IVA Process Wastewater for Pumps	N	Process water quality inadequate
4A-IVB SBWR for Pumps	N	SBWR recycled water quality inadequate
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Process water quality inadequate
4B-IIA Maximize Cycles of Concentration	N	Focusing on recycling RO reject into cooling towers
4B-IIB Reuse RO Reject or Process Wastewater	A	Recycle RO reject
4B-IIIA Reuse Scrubber Wastewater	N	Scrubber discharge water quality inadequate
4B-IIIB Reuse Process Wastewater	N	Process water quality inadequate
4B-IIIC SBWR for Scrubbers	N	SBWR recycled water quality inadequate
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	E	In Tape Automated Bumping (TAB)/C4 Operations
4C-IB Counter Current Rinses	N	TAB/C4 Operations have spray rinses only
4C-IC Spray Rinse Systems	E	In TAB/C4 Operations
4C-ID Spray Rinse/Evap Makeup Sytems	N	TAB/C4 Operations have spray rinses only
4C-IE Oversprays/Foggers	N	TAB/C4 Operations have spray rinses only
4C-IF Sensor Activated Rinses	E	In TAB/C4 Operations
4C-IG Timer Flow Controls	E	In TAB/C4 Operations
4C-IH Conductivity Flow Controls	N	TAB/C4 Operations have sensor activated rinses and time controls only
4C-IIA Use in Scrubbers/Cooling Towers	N	Treated process water quality inadequate in TAB/C4 Operations
4C-IIB Reuse Process Rinsewater	E	In TAB/C4 Operations
4C-IIC Reuse of Treated Wastewater	N	Treated process water quality inadequate in TAB/C4 Operations
4C-IIIA Mechanical Mixers	E	In TAB/C4 Operations
4C-IIIB Air Agitation	N	TAB/C4 Operations have mechanical mixers only
4C-IIIC Sonics	N	TAB/C4 Operations have mechanical mixers only
4C-IIID Tank Arrangement	E	In TAB/C4 Operations
4C-IIIE Workpiece Agitation	N	TAB/C4 Operations have mechanical mixers only
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	E	In D2(P1/P2) Manufacturing
4D-IB Hot Ultra Pure	E	In D2(P1/P2) Manufacturing
4D-IC Megasonic Rinsing	E	In D2(P1/P2) Manufacturing
4D-ID Spin Rinsing	E	In D2(P1/P2) Manufacturing
4D-IE Rinse Tank Geometry	E	In D2(P1/P2) Manufacturing
4D-IF Idle Flow Reduction	E	In D2(P1/P2) Manufacturing
4D-II Wet Benches with Built-In Recycling	E	In D2(P1/P2) Manufacturing
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Not feasible in D2 (P1/P2) cooling towers
5A-IB Ozonation	N	Not feasible in D2 (P1/P2) cooling towers
5A-IC SBWR for Cooling Towers	N	SBWR water quality inadequate
5A-ID Replace with Mechanical Cooling	N	Not feasible in D2 (P1/P2)
5A-IE Softening	E	
5A-II Reverse Osmosis		Did not understand for process reuse
5A-III High Efficiency RO	E	
5A-IV Ion Exchange		Did not understand for process reuse
5A-V Electrodeionization (EDI)		Did not understand for process reuse

Additional Measures Assessed (if any)

pH Control in Scrubbers

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Jefferson Smurfit

SC-003C Other Industrial: Paperboard

1997 Flows (gpd) 300,936 Permitted Industrial Discharge
1999 Flows (gpd) 310,308 Permitted Industrial Discharge

The study submitted had minor deficiencies that were clarified after meeting with the discharger. Nine projects were identified and six were scheduled for implementation with a potential wastewater discharge reduction of more than 33,000 gpd. Because they were scheduled for implementation, the company did not complete the cost analysis sheets for all projects identified.

Jefferson Smurfit is scheduled to be connected to the South Bay Water Recycling (SBWR) system and is planning to phase in the use of SBWR water by replacing approximately 10% of their potable water used in manufacturing and/or irrigation with SBWR water. The use of SBWR water in the cooling towers needed further evaluation before they would consider using it as a permanent source of water to the towers.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Removal of anti-freeze water from clay pumps.	180	$210	$0	0.00	5/31/99		☑
2	Instant hot water heaters on wash basins.	5	$600	$0	0.00	5/31/99		☑
3	ULFT installation.	568	$5,499	$0	0.00	3/31/00		☑
4	Shield shower nozzle size.	24,480	$1,280	$0	0.00	12/31/99		☑
5	Internal lubrication shower for press roll	8,000	$5,000	$0	0.00	ongoing		☐
6	SBWR water for irrigation	0	$0	$0	0.00	ongoing	SBWR replaces 3000 gpd water used, but not flow into sewer	☐
7	SBWR water for cooling tower makeup	0	$0	$0	0.00	N/A	Not cost effective due to cycle up time (not evaluated in Worksheets 5D-5G)	☐
8	Mechanical Seals	0	$0	$0	0.00	N/A	Already uses process water	☐
9	Injectable Packing on Pumps (no seal water)	0	$0	$0	0.00	N/A	Already using process water	☐

Total for All Projects	**33,233**	***gpd***
Total for <5 Year Payback		***gpd***
Total for Completed Projects	**25,233**	***gpd***

Jefferson Smurfit

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	A	Some mill areas need power assisted toilets due to high traffic
4A-IB Aerators Retrofit	A	Shift mechanics retrofitting
4A-IC Showerhead Replacement	A	Shift mechanics retrofitting
4A-IIA Process Wastewater for Irrigation	N	Cost of treatment is too expensive. Use SBWR water instead.
4A-IIB SBWR for Irrigation	A	City will hookup SBWR recycle water
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	E	
4A-IVA Process Wastewater for Pumps	E	
4A-IVB SBWR for Pumps	N	SBWR water would mix with process water which is undesirable.
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Process water would cost too much to treat for makeup.
4B-IIA Maximize Cycles of Concentration	E	Running at 7.5 cycles, blow down not used for other processes
4B-IIB Reuse RO Reject or Process Wastewater	N	RO put back into fresh water inlet and used in higher std. situations than cooling tower wat
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers.
4B-IIIB Reuse Process Wastewater	N	No scrubbers.
4B-IIIC SBWR for Scrubbers	N	No scrubbers.
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	E	
5A-IB Ozonation	A	No evaluation and not scheduled
5A-IC SBWR for Cooling Towers	N	Not considered cost effective due to increase in cycle time although 5D-5G were not comp
5A-ID Replace with Mechanical Cooling	E	
5A-IE Softening	A	No evaluation and not scheduled
5A-II Reverse Osmosis	E	
5A-III High Efficiency RO	N	Current R.O. system is adequate.
5A-IV Ion Exchange	X	Not applicable technology for paperboard reuse
5A-V Electrodeionization (EDI)	X	Not applicable technology for paperboard reuse

Additional Measures Assessed (if any)

Removal of anti-freeze water from clay pumps.
Instant hot water heaters on wash basins.
Shield shower nozzle size adjustment.
Internal lubrication for press rolls.

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Komag Inc. Bldg 10

SJ-341A Disk/Head Manufacturer

1997 Flows (gpd)	118,502	Permitted Industrial Discharge
1999 Flows (gpd)	73,067	Permitted Industrial Discharge

Komag is a rigid magnetic memory hard disk manufacturer. Two facilities, Komag Buildings 6 and 9 were closed in 2000. The study for Building 10 was received on time and completed after responding to the comments provided to them. Komag also broke down processes by function, which eased review. Although Komag did not identify any new water reduction projects, several RCMs were existing and they did state that they are committed to water conservation.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
	None	0	$0	$0	0.00			☐

Total for All Projects	**0**	*gpd*
Total for <5 Year Payback		*gpd*
Total for Completed Projects		*gpd*

Komag Inc. Bldg 10

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	N	No showers at site
4A-IIA Process Wastewater for Irrigation	N	Process water effluent is of variable quality and may contain metals and other contaminan
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	N	Facility has no pumps requiring seal water.
4A-IIIB Process Wastewater for Seals	N	Facility has no pumps requiring seal water.
4A-IVA Process Wastewater for Pumps	N	Facility has no liquid ring vacuum pumps.
4A-IVB SBWR for Pumps	N	Facility has no liquid ring vacuum pumps.
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Steam boiler used to humidify clean rooms, and therefore, could contaminate these rooms
4B-IIA Maximize Cycles of Concentration	E	
4B-IIB Reuse RO Reject or Process Wastewater	E	
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	E,N	In M1and M3; M2 uses sensor activated controls, M4 uses automated controls
4C-IB Counter Current Rinses	E,N	In M1, M2 and M3, M4 has no rinse steps
4C-IC Spray Rinse Systems	E,N	In M1, M2 and M3. M4 has no rinse steps
4C-ID Spray Rinse/Evap Makeup Sytems	N	Evaporation is not significant in all processes
4C-IE Oversprays/Foggers	E,N	In M1 and M2; Spray rinses are significant for M3 and M4 has no rinse steps
4C-IF Sensor Activated Rinses	E,N	In M1 and M2, M3 uses timers and M4 has no rinse steps
4C-IG Timer Flow Controls	E,N	In M2 and M3, M1 sensor-activity based on other parameters and M4 has no rinse steps
4C-IH Conductivity Flow Controls	N	In M4; M1 sensor-activity based on other parameters and M2 and M3 use timers
4C-IIA Use in Scrubbers/Cooling Towers	E,N	In M1, M2, and M3; Water from M3 already exceeds demand
4C-IIB Reuse Process Rinsewater	E, N	In M4; Not acceptable quality for other uses in M1, M2, and M3
4C-IIC Reuse of Treated Wastewater	N	Treated wastewater is not of sufficient quality for process uses
4C-IIIA Mechanical Mixers	E,N	In M2; M1 agitates other ways, M3 agitates with tank arrangement, M4 has no cleaning or
4C-IIIB Air Agitation	N	IM1 and M2 agitate other ways, M3 agitates w/ tank arrangement, M4 has no cleaning or ri
4C-IIIC Sonics	E,N	In M2; M1 agitates other ways, M3 agitates with tank arrangement, M4 has no cleaning or
4C-IIID Tank Arrangement	E,N	In M1, M2 and M3; M4 has no cleaning or rinsing
4C-IIIE Workpiece Agitation	E,N	In M1; M2 agitates other ways, M3 agitates w/ tank arrangement, M4 has no cleaning or ri
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	E	
4D-IB Hot Ultra Pure	N	Uses spray rinses to optimize water
4D-IC Megasonic Rinsing	N	Uses spray rinses to optimize water
4D-ID Spin Rinsing	N	Uses spray rinses to optimize water
4D-IE Rinse Tank Geometry	E	
4D-IF Idle Flow Reduction	E	
4D-II Wet Benches with Built-In Recycling	N	Facility does not manufacture semiconductors
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Rinse water used is high quality so no filtration required
5A-IB Ozonation	N	Ozonation was tested and found to damage cooling tower components
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	N	Since using reclaimed water, not water reduction using this measure
5A-IE Softening	N	Rinse water used is high quality so no filtration required
5A-II Reverse Osmosis	N	Use of RO for wastewater reuse has not been proven in hard disk manufacturing industry.
5A-III High Efficiency RO	E	
5A-IV Ion Exchange	N	Use of ion exchange for reuse has not been proven in hard disk manufacturing industry.
5A-V Electrodeionization (EDI)	N	Use of EDI for reuse has not been proven in hard disk manufacturing industry.
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Linear Technology

MI-006A Semiconductor

1997 Flows (gpd)	179,937	Permitted Industrial Discharge
1999 Flows (gpd)	204,377	Permitted Industrial Discharge

Linear Technology is a semiconductor company focussed on linear integrated circuits. Their first submission was on time but required clarification of discrepancies in the flow balance. Their final submittal did clarify the overall flow balance but approximately 27,000 gallons per day of flow remains as "Other Non Potable Uses". Linear Technology identified these uses but flow rates for each remain underdetermined, and flow balances of those individual uses are accomplished without accounting for the flows from "Other Non-Potable Uses". The manufacturing uses were originally noted only as a single use; subsequent breakdown did not identify flow volumes specific to the steps in the process. As with several companies, the evaluation of RCMs was completed only for the fab as a single unit, so it was unclear to what extent rinse efficiency measures were being employed.

The company reclaims more than 33,000 gpd from their process lines for use in the cooling towers and scrubbers. That reclaim system, however, also requires more than 11,000 gpd of city make up water to meet demand. They cited space constraints for treatment equipment as the barrier to replacing this make up water with other reclaimable waters. No cost-effective projects were identified through the Audit; however, Linear did replace their showerheads in March 2000 despite citing that project as having a payback greater than five years.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Showerhead retrofit	40	$741	$52	14.14		Payback based on simple payback calculation	☑
2	SBWR to Gray water (process reclaim) for low periods,	0	$69,525	($126)			Additional SBWR usage: 11,596 gpd. Neg Annual Benefit	☐
3	Gray Water to Bldg. 2 Scrubber	0	$68,750	($1,240)			Additional SBWR usage: 2,452 gpd. Neg Annual Benefit	☐

Total for All Projects	**40**	*gpd*
Total for <5 Year Payback		*gpd*
Total for Completed Projects	**40**	*gpd*

Linear Technology

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E,>5	May only be low flow toilets, not ultra low, had a greater than five year payback
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	Already using SBWR water
4A-IIB SBWR for Irrigation	E	Connected 1998
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	No seal water
4A-IVA Process Wastewater for Pumps	E	Pumps are on process water system via CT system
4A-IVB SBWR for Pumps	N	Already using process water
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Would require approval of Insurance Co, Water Treatment Co, and State Industrial Board
4B-IIA Maximize Cycles of Concentration	E	
4B-IIB Reuse RO Reject or Process Wastewater	E	Approximately 2/3 fed by process water
4B-IIIA Reuse Scrubber Wastewater	N	Already using 2/3 process water
4B-IIIB Reuse Process Wastewater	E	Approximately 2/3 fed by process water
4B-IIIC SBWR for Scrubbers	N	Already using 2/3 process water
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	E	
4D-IB Hot Ultra Pure	E	
4D-IC Megasonic Rinsing	E	
4D-ID Spin Rinsing	E	
4D-IE Rinse Tank Geometry	E	
4D-IF Idle Flow Reduction	E	
4D-II Wet Benches with Built-In Recycling	E	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	E	
5A-IB Ozonation	E	
5A-IC SBWR for Cooling Towers	A	Already using 2/3 process water, not scheduled
5A-ID Replace with Mechanical Cooling	N	Rejection heat load is too great
5A-IE Softening	N	Space constraints
5A-II Reverse Osmosis	N	Space and power distribution unavailable
5A-III High Efficiency RO	E	2nd Pass RO
5A-IV Ion Exchange	N	Space unavailable for waste treatment IX
5A-V Electrodeionization (EDI)	N	Space and power distribution unavailable

Additional Measures Assessed (if any)

SBWR to Gray water (process reclaim) for low periods, not scheduled

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Lockheed Martin Fairchild Systems

MI-072A Semiconductor

1997 Flows (gpd)	98,714	Permitted Industrial Discharge
1999 Flows (gpd)	63,604	Permitted Industrial Discharge

This Lockheed site is a semiconductor manufacturer, specializing in unique applications rather than high volume production. They submitted the Audit on time but with significant clarification needed, including more detail on the distinct processes in the fab and a balance of flows throughout the facility. While the breakdown on the fab was completed, the challenge of balancing the flows for this facility remained, largely due to their aggressive and successful pursuit of flow reduction. Since some of these water-saving projects took place during the year they were using to complete the study, it confounded the data and made it difficult to balance overall flows. In 1998 (the subject year used for the study), they installed a reclaim system which uses water from the AWNS in scrubbers and cooling towers, saving more than 25,000 gpd. During completion of their Audit, they also implemented a project in the fab sinks to reuse idle rinse waters and restrict idle flow volumes. It is estimated that this project resulted in additional savings of more than 35,000 gpd. Since completion of the Audit, this company installed a new effluent flow meter and planned to submit a revised flow balance diagram, including reuse loops, in summer of 2000.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Rerouting RO Reject direct to sewer	525	$4,691	$205	28.24		In accordance with FAS, implementation not required at this time.	☐
2	ULFTs and Urinals	780	$6,000	$1,110	5.40		In accordance with FAS, implementation not required at this time.	☐
3	Replace showerheads	40	$25	$57	0.44		In accordance with FAS, implementation not required at this time.	☐
4	Employee Training	1,500	$1,200	$2,135	0.56		In accordance with FAS, implementation not required at this time.	☐

Total for All Projects	**2,845**	*gpd*
Total for <5 Year Payback	**1,540**	*gpd*
Total for Completed Projects		*gpd*

Lockheed Martin Fairchild Systems

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	A	Replace 2 units, not scheduled
4A-IIA Process Wastewater for Irrigation	N	Using SBWR recycled water
4A-IIB SBWR for Irrigation	E	
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	Only mechanical seals used on facility pumps
4A-IVA Process Wastewater for Pumps	N	Only mechanical seals used on facility pumps
4A-IVB SBWR for Pumps	N	Only mechanical seals used on facility pumps
4A-VA Statistical Process Control	N	Production fluctuations make it difficult to employ SPC
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	A	Not scheduled
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	High TDS
4B-IIA Maximize Cycles of Concentration	E	Exceeds 6 cycles, using process WW
4B-IIB Reuse RO Reject or Process Wastewater	E	RO reject through AWNS
4B-IIIA Reuse Scrubber Wastewater	E	through AWN reclaim
4B-IIIB Reuse Process Wastewater	E	
4B-IIIC SBWR for Scrubbers	N	Using process water
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	N	Cleaning solution will foam like soap; water on only when needed; sinks too old for upgra
4D-IB Hot Ultra Pure	N	process limitations and space constraints
4D-IC Megasonic Rinsing	N	process limitations and possible risk impacts
4D-ID Spin Rinsing	N	process limitations and possible risk impacts
4D-IE Rinse Tank Geometry	E	
4D-IF Idle Flow Reduction	E	
4D-II Wet Benches with Built-In Recycling	N	floor space constraints
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	
5A-IB Ozonation	N	Invalid basis for water reduction, not guarenteed, too much cost and hazard (not evaluted i
5A-IC SBWR for Cooling Towers	N	Currently using process water (RO reject)
5A-ID Replace with Mechanical Cooling	N	cost prohibitive
5A-IE Softening	N	Not needed, may divert RO reject past neutralization
5A-II Reverse Osmosis	N	Risk to product, cost prohibited (not evaluated in 5A-5G)
5A-III High Efficiency RO	N	Risk to product, not technically viable
5A-IV Ion Exchange	N	Risk to product, not technically viable
5A-V Electrodeionization (EDI)	N	Risk to product, not technically viable

Additional Measures Assessed (if any)

Rerouting RO Reject direct to sewer, not scheduled

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

LSI Logic

SC-046A Semiconductor

1997 Flows (gpd)	218,548	Permitted Industrial Discharge
1999 Flows (gpd)	203,606	Permitted Industrial Discharge

LSI Logic is a semiconductor manufacturing facility. Their original submission was on time and required only minor clarifications on flows and some of the project evaluation. Additional information was submitted in a timely manner. While LSI Logic was completing the Audit, they were also amidst a flow reduction project to reuse a significant portion of their process water. That project did not prove fruitful but they continue to pursue alternative avenues such as reuse of treated process water into scrubbers and cooling towers. Additionally, while evaluating rinse efficiency measures for the Audit, they found significant opportunities for savings in reducing flows in process sinks during idle production periods. A project was implemented immediately with water savings of 9,000 gpd at minimal cost to the company. The AWNS reuse project has a potential water savings of more than 40,000 gpd.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Process Wastewater to Scrubbers/CTs	43,600	$171,865	$19,103	9.00	5/30/00		☐
2	Batch sink idle flow reduction	9,050	$8,500	$17,215	0.49	3/30/00	Completed	☑
3	High Efficiency RO for Ultra Pure Water	43,600	$136,560	$15,047	9.08	5/24/99	Installed Installed	☑

Total for All Projects	**96,250**	***gpd***
Total for <5 Year Payback	**9,050**	***gpd***
Total for Completed Projects	**52,650**	***gpd***

LSI Logic

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	Already at 3.5 gpf
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	Would require large water storage; limited space
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	N	No water seals
4A-IIIB Process Wastewater for Seals	N	No water seals
4A-IVA Process Wastewater for Pumps	N	No water seals
4A-IVB SBWR for Pumps	N	SBWR not available, no water seals
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Would require extensive treatment; little savings
4B-IIA Maximize Cycles of Concentration	E	
4B-IIB Reuse RO Reject or Process Wastewater	>5	But scheduled
4B-IIIA Reuse Scrubber Wastewater	N	Water would require extensive treatment
4B-IIIB Reuse Process Wastewater	>5	But scheduled
4B-IIIC SBWR for Scrubbers	N	SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	E,N	In 3 sinks (in Strip, Spray and DNS sinks) had high cost, cannot replace all, Not in polish
4D-IB Hot Ultra Pure	E	
4D-IC Megasonic Rinsing	N	Disruptive to 0.15 Micron Technology (lithography)
4D-ID Spin Rinsing	E,N	Not in Strip, Wafer Scrubbers and DNS Clean Sinks; deemed too expensive
4D-IE Rinse Tank Geometry	E,N	Not in Polishing, Wafer Scrubbers since no rinse tanks
4D-IF Idle Flow Reduction	E,A,N	Applicable for Polishing, Wafer Scrubbers, Strip Sinks, DNS Clean; No idle time in Spray t
4D-II Wet Benches with Built-In Recycling	E,N	Not Applicable for DNS Clean Sinks
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	E	
5A-IB Ozonation	N	
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	E	Have some mechanical cooling
5A-IE Softening	E	
5A-II Reverse Osmosis		Was noted as Existing but only for pretreatment, did not understand was for pretreatment
5A-III High Efficiency RO	A	Greater than 5 year payback, but installed
5A-IV Ion Exchange		Did not understand was for reuse
5A-V Electrodeionization (EDI)	N	
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Micrel Inc.

SJ-258A Semiconductor

1997 Flows (gpd) 130,291 Permitted Industrial Discharge
1999 Flows (gpd) 149,609 Permitted Industrial Discharge

Micrel, a semiconductor manufacturer, submitted its flow audit study on time. After responding to a comment letter, the forms were determined to be complete. The methods used to calculate flow data versus actual flow meter readings were questionable. Micrel chose not to break down its manufacturing processes and some of the methods used did not provide adequate references.

Among the projects Micrel listed, spray rinsing should also have been evaluated. They already had a two stage RO system installed prior to 1998. Only fab water reduction, optimization of cooling tower's cycles of concentration, and recycle of pump "gland" water were determined to be within a five-year payback. The only potential CEFRMs considered applicable included softening in cooling towers. However, this measure was not further evaluated or discussed further in the flow audit study. Cost data for all projects were considered questionable and the arguments for technical unfeasibility of reusing process water were inadequate.

Nevertheless, Micrel did commit to purchasing water efficient technology at the time of replacement for older tools and sinks. Micrel will implement the fab water reduction project starting in June 2000 and intends to replace its existing cooling towers with more water efficient models in the next two years as part of a major facility upgrade. Micrel will also evaluate the use of ultra low flush toilets/urinals on a trial basis.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
2	Minimizing Fab Waste (repairing leaks, training, etc.)	7,200	$33,528	$51,237	0.65			☐
3	Reusing Process Water in Scrubbers	7,300	$168,610	$8,655	19.48		greater than 5 year payback	☐
4	Replacing Toilets and Urinals with Ultra Low Flush Fixtures	3,403	$65,949	$3,405	19.37		greater than 5 year payback, but will evaluate more fully	☐
5	Addition of Second RO for incoming process water	16,950	$163,922	$16,473	9.95	12/97	Already existing, just given for costs	☐
7	Optimization of Cooling Towers	10,303	$79,249	$21,353	3.71		Will evaluate with installation of new cooling towers	☐
8	Recycling pump "gland" water (seal water)	2,160	$7,480	$1,970	3.80	TBD	Implementation will be determined by Micrel	☐

Total for All Projects **47,316** ***gpd***
Total for <5 Year Payback **19,663** ***gpd***
Total for Completed Projects ***gpd***

Micrel Inc.

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	
4A-IB Aerators Retrofit	>5	
4A-IC Showerhead Replacement	>5	
4A-IIA Process Wastewater for Irrigation	N	Poor water quality
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	
4A-IVA Process Wastewater for Pumps	N	
4A-IVB SBWR for Pumps	N	
4A-VA Statistical Process Control	N	
4A-VB Inspection/Maintenance	A	Minimizing Fab water waste, leaks etc,
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boiler
4B-IIA Maximize Cycles of Concentration	A	
4B-IIB Reuse RO Reject or Process Wastewater	N	Poor water quality due to use of two stage RO
4B-IIIA Reuse Scrubber Wastewater	N	
4B-IIIB Reuse Process Wastewater	>5	
4B-IIIC SBWR for Scrubbers	N	SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	A	Will consider during replacement
4D-IB Hot Ultra Pure	N	Would effect product quality
4D-IC Megasonic Rinsing	E	
4D-ID Spin Rinsing	E	
4D-IE Rinse Tank Geometry	N	Existing tanks cannot be changed
4D-IF Idle Flow Reduction	A	Will consider during replacement
4D-II Wet Benches with Built-In Recycling	A	Will consider during replacement
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	
5A-IB Ozonation	N	
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	N	
5A-IE Softening	A	
5A-II Reverse Osmosis	E,N	Micrel uses 2nd stage RO, but does not reuse other process waters
5A-III High Efficiency RO	E	
5A-IV Ion Exchange	N	Although not evaluated in Worksheets 5B-5G as directed, deemed to costly
5A-V Electrodeionization (EDI)	N	Although not evaluated in Worksheets 5B-5G as directed, deemed to costly

Additional Measures Assessed (if any)

Pump Gland Recycle

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Paramount Great America

SC-PARA Commercial: Theme Park

1997 Flows (gpd)	271,469	Annual Water Consumption (excluding landscape)
1999 Flows (gpd)	163,707	Annual Water Consumption

Perhaps the most unique of all our large dischargers, Great America is an amusement park complete with thrill rides and live entertainment. Their discharge is very seasonal since the park is not consistently open year round. Off-peak activities still include large group events and park maintenance. The park has an on-site recycling system whereby most of the rides discharge to a large lake from which water is pumped for irrigation and for backup supply for fire protection.

Since completing the Audit, the park began using SBWR water where well water had previously been used. This includes some irrigation, pond makeup, and fire protection. Their use of SBWR was estimated at 60,000 gpd. Additional projects were evaluated but none were found cost effective, with the exception of simple faucet modifications. The largest project would be the replacement of older toilets with Ultra Low Flush models. But the 194 public area toilets are special "blow-out" types commonly used in extremely high traffic applications. Unfortunately, there is no ULFT retrofit counterpart to them; thus replacement would require extensive wall repair and retiling.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	SBWR for Ponds & Irrigation	0	$53,177	$44,085	1.21	Completed	Completed	☑
2	Install Low Flow Fixtures	69,308	$1,072,057	$25,926	41.35		Only as needed with remodeling	☐
3	Pump Gland water substitution	0	$34,521	$5,896	5.85		Not Cost Effective, no flow data, sewer benefits, not included	☐
4	Faucet Modifications	1,700	$1,235	$1,073	1.15	TBD		☐
6	Nickelodeon backwash reroute for reuse	18,000	$62,116	$4,158	14.94		Not Cost Effective	☐
7	Water saver for laundry	874	$12,410	$301	41.23		Not Cost Effective	☐

Total for All Projects	**89,882**	*gpd*
Total for <5 Year Payback	**1,700**	*gpd*
Total for Completed Projects	**0**	*gpd*

Paramount Great America

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	Have 33 ULFTs; 231 toilets and 94 urinals are special type for which there is no ULFT
4A-IB Aerators Retrofit	A	112 Units, not scheduled to be determined
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	E	Process water from rides
4A-IIB SBWR for Irrigation	E	
4A-IIIA Mechanical Seals	N	Evaluated project proposing to close loop (>5)
4A-IIIB Process Wastewater for Seals	>5	Evaluated project proposing to close loop
4A-IVA Process Wastewater for Pumps	N	Evaluated project proposing to close loop (>5)
4A-IVB SBWR for Pumps	N	Evaluated project proposing to close loop (>5)
4A-VA Statistical Process Control	N	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boiler
4B-IIA Maximize Cycles of Concentration	N	No cooling tower
4B-IIB Reuse RO Reject or Process Wastewater	N	No cooling tower
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	No cooling tower
5A-IB Ozonation	N	No cooling tower
5A-IC SBWR for Cooling Towers	N	No cooling tower
5A-ID Replace with Mechanical Cooling	N	No cooling tower
5A-IE Softening	N	No cooling tower
5A-II Reverse Osmosis	X	
5A-III High Efficiency RO	X	
5A-IV Ion Exchange	X	
5A-V Electrodeionization (EDI)	X	

Additional Measures Assessed (if any)

Nickelodeon backwash reroute for reuse, >5
Water saver for laundry, <5

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Read-Rite Corp.

MI-004A Disk/Head Manufacturer

1997 Flows (gpd)	112,185	Permitted Industrial Discharge
1999 Flows (gpd)	51,550	Permitted Industrial Discharge

The study submitted was not complete after sending a comment letter and attempting to obtain the missing information in person. Missing pieces of information included a fully detailed block flow diagram and completed worksheets for Section 4C. Read-Rite had stated in correspondence that there were no meters at the locations where their recycling/reuse occurs. The City may pursue this information in the future. However, since Read-Rite submitted information confirming the permanent closure of their wafer fab production at this site for relocation to Fremont and the flows have been reduced by more than 50 percent, the City will not require them to provide the flow details at this time. The only processes remaining at this location are the Tape Head division and the Slider Fab production. Three reasonable control measures were identified; none were scheduled for implementation.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
II.A.	Reuse of process water for irrigation	1,850	$0	$0	0.00			☐
II.AI	Cooling tower cycles improved to 5.5.	20,250	$0	$0	0.00			☐
V.C.	Employee training	1,500	$0	$0	0.00			☐

Total for All Projects	**23,600**	***gpd***
Total for <5 Year Payback		***gpd***
Total for Completed Projects		***gpd***

Read-Rite Corp.

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	N	No showers.
4A-IIA Process Wastewater for Irrigation	A	No cost data or schedule for implementation
4A-IIB SBWR for Irrigation	N	SBWR unavailable.
4A-IIIA Mechanical Seals	N	Use a closed loop liquid ring seal.
4A-IIIB Process Wastewater for Seals	N	Use a closed loop liquid ring seal.
4A-IVA Process Wastewater for Pumps	N	Use a closed loop liquid ring seal. Little make-up water required.
4A-IVB SBWR for Pumps	N	SBWR unavailable.
4A-VA Statistical Process Control	N	Process operations vary with business conditions, research & development.
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	A	No cost data or schedule for implementation
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Closed loop system. Make-up water, when needed, is from the chilled water loop.
4B-IIA Maximize Cycles of Concentration	A	No cost data or schedule for implementation
4B-IIB Reuse RO Reject or Process Wastewater	N	1st. stage RO sent to 2nd. Stage.
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers.
4B-IIIB Reuse Process Wastewater	N	No scrubbers.
4B-IIIC SBWR for Scrubbers	N	Outside SBWR service area.
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	E	
4D-IB Hot Ultra Pure	E	In use at Gold Station.
4D-IC Megasonic Rinsing	E	
4D-ID Spin Rinsing	E	
4D-IE Rinse Tank Geometry	N	Use other RCMs.
4D-IF Idle Flow Reduction	N	There are no wet decks with continuous flow rinses.
4D-II Wet Benches with Built-In Recycling	N	There are no wet decks with continuous flow rinses.
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Improve COCs in cooling towers more cost effective.
5A-IB Ozonation	N	Water use reduction by ozonation is not based on valid engineering data.
5A-IC SBWR for Cooling Towers	N	Not in SBWR service area.
5A-ID Replace with Mechanical Cooling	N	Cost prohibitive.
5A-IE Softening	N	Improve COCs in cooling towers more cost effective.
5A-II Reverse Osmosis	N	Reuse of process water for DI water production is not viable w/o signif risk to product yield
5A-III High Efficiency RO	N	Reuse of process water for DI water production is not viable w/o signif risk to product yield
5A-IV Ion Exchange	N	Reuse of process water for DI water production is not viable w/o signif risk to product yield
5A-V Electrodeionization (EDI)	N	Reuse of process water for DI water production is not viable w/o signif risk to product yiel
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

San Jose Medical Center

SJ-SJME Institutional: Hospital

1997 Flows (gpd) 149,145 Annual Water Consumption (SSUC)
1999 Flows (gpd) 155,387 Annual Water Consumption (SSUC)

The study submitted had minor deficiencies that were resolved after a comment letter was sent. Overall, the detailing of the flows/water use within the complex was well done.

Major portions of this facility are scheduled for closure within the next two years because many of the structures cannot meet the new seismic requirements that will be enforced in 2003. Because of this, the City did not require them to evaluate the cost of replacing their existing toilets at this facility, since the largest number of the toilet replacements would be in an area scheduled for closure. The facilities director expressed commitment to water efficiency. The hospital's cooling towers have been running at approximately six cycles of concentration for many years, they have replaced the shower heads with low-flow shower heads, and they have a strong inspection and maintenance program in place. The four projects evaluated were scheduled for implementation by the middle of 2000. These projects have a potential reduction of at nearly 10,000 gpd.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Vacuum Pump Water Recycle	3,400	$12,000	$4,000	3.00	3/1/00		☐
2	Instrument Washers Sterris System	2,500	$80,000	$1,825	43.84	12/15/99		☐
3	Waterless hand sanitizer	4,000	$0	$2,900	0.00		Capital cost and payback data not provided, implementation ongoing	☑
4	Water Wise Employee Training	0	$0	$0	0.00		No flow or cost data or implementation date.	☑

Total for All Projects **9,900** ***gpd***
Total for <5 Year Payback **3,400** ***gpd***
Total for Completed Projects **4,000** ***gpd***

San Jose Medical Center

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	A	As replacements needed
4A-IB Aerators Retrofit	N	Not allowed in hospitals
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	No process water
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals		
4A-IIIB Process Wastewater for Seals		
4A-IVA Process Wastewater for Pumps	A	Project to recycle water for vacuum pumps
4A-IVB SBWR for Pumps	N	SBWR not available
4A-VA Statistical Process Control	N	Hospital not manufacturing
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E,A	Project called Waterwise Employee Training
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No process water
4B-IIA Maximize Cycles of Concentration	E	
4B-IIB Reuse RO Reject or Process Wastewater	N	No process water
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration		
5A-IB Ozonation		
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling		
5A-IE Softening		
5A-II Reverse Osmosis	X	
5A-III High Efficiency RO	X	
5A-IV Ion Exchange	X	
5A-V Electrodeionization (EDI)	X	

Additional Measures Assessed (if any)

Waterless hand sanitizer (no cost data)
Instrument washers Sterris System >5

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

San Jose State University

SJ-SJSU Institutional: Educational

1997 Flows (gpd) 675,891 Annual Water Consumption
1999 Flows (gpd) 538,829 Annual Water Consumption

San Jose State's major operation besides student instruction includes power production from a power generation plant. San Jose State submitted its Audit on time and all flows and water uses appeared to be consistent and accurate. However, water use in the laboratory was not evaluated for flow reduction methods because the water use in the labs was not considered significant. Of the projects evaluated, three were deemed cost effective. These include the use of SBWR in cooling towers and awareness training for employees.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Urinal replacement	300	$22,645	$471	48.08			☐
2	Toilet replacement	510	$23,699	$401	59.10			☐
3	Showerhead replacement	9,828	$32,748	$7,714	4.25	TBD		☐
4	SBWR for cooling towers	0	$39,684	$18,094	2.19	6/1/99		☑
5	SBWR for main campus irrigation		$58,021	$8,497	6.83	TBD	Awaiting DHS Approval	☐
6	Employee Awareness Training	0	$1,803	$856	2.11	TBD		☐

Total for All Projects **10,638** ***gpd***
Total for <5 Year Payback **9,828** ***gpd***
Total for Completed Projects **0** ***gpd***

San Jose State University

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	
4A-IB Aerators Retrofit	A	Not scheduled or evaluated in Worksheets 5-7
4A-IC Showerhead Replacement	A	Not scheduled, to be determined
4A-IIA Process Wastewater for Irrigation	N	Not suitable process water
4A-IIB SBWR for Irrigation	A	Although < 5 year payback (6.8), SJSU is committed to saving water and is installing anyw
4A-IIIA Mechanical Seals	N	Negligible water use
4A-IIIB Process Wastewater for Seals	N	Negligible water use
4A-IVA Process Wastewater for Pumps	N	Negligible water use
4A-IVB SBWR for Pumps	N	Negligible water use
4A-VA Statistical Process Control	N	No process water
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	A	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Closed loop boiler
4B-IIA Maximize Cycles of Concentration	A	Currently studying effects of raising the cycles of concentration when using recycled wate
4B-IIB Reuse RO Reject or Process Wastewater	N	Using SBWR recycled water
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	
5A-IB Ozonation	N	
5A-IC SBWR for Cooling Towers	E	
5A-ID Replace with Mechanical Cooling	N	
5A-IE Softening	N	
5A-II Reverse Osmosis	X	
5A-III High Efficiency RO	X	
5A-IV Ion Exchange	X	
5A-V Electrodeionization (EDI)	X	
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Sanmina Corp. Plant I

SJ-022A Printed Circuit Board Manufacturing

1997 Flows (gpd) 72,247 Permitted Industrial Discharge
1999 Flows (gpd) 93,551 Permitted Industrial Discharge

The study submitted had minor deficiencies that were corrected during site meetings. The studies for Sanmina I and Sanmina II were basically the same because both plants are designed with a similar layout. Sanmina has automated lines which were designed with some reasonable control measures in place; however, Sanmina also stated that the automated process line design prevented them from implementing many other reasonable control measures. There are no cooling towers at either of these facilities. One type of project was evaluated for both facilities and even though the payback was greater than 5 years, it was scheduled for implementation. The project is a wastewater treatment system that would pretreat the final effluent for reuse in manufacturing using ion exchange and deionization. It is estimated that approximately 25,000 gpd could be treated and reused in the manufacturing process at each facility. Sanmina scheduled to complete these projects by December 2000.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Recycling of treated process wastewater in process	25,928	$117,387	$6,606	17.77	9/1/00		☐

Total for All Projects	**25,928**	*gpd*
Total for <5 Year Payback		*gpd*
Total for Completed Projects		*gpd*

Sanmina Corp. Plant I

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	Irrigation <1000 gpd, considered negligible
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	Uses mechanical seals
4A-IVA Process Wastewater for Pumps	N	
4A-IVB SBWR for Pumps	N	
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boilers
4B-IIA Maximize Cycles of Concentration	E	Closed loop cooling, <20 gallons of week used so negligible
4B-IIB Reuse RO Reject or Process Wastewater	N	Closed loop cooling, <20 gallons of week used so negligible
4B-IIIA Reuse Scrubber Wastewater	N	Flow is negligible
4B-IIIB Reuse Process Wastewater	N	Flow is negligible
4B-IIIC SBWR for Scrubbers	N	SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	E	
4C-IB Counter Current Rinses	E	
4C-IC Spray Rinse Systems	N,E	Not in EP since premanufactured unmodifiable, 4C-IA and IB replace in manual CU
4C-ID Spray Rinse/Evap Makeup Sytems	N	Not in EP, DE premanufactured unmodifiable; redundant in SB, ET, ST; bath dilution in
4C-IE Oversprays/Foggers	N	Not in EP, DE premanufactured unmodifiable; redundant in SB, ET, ST; bath dilution in
4C-IF Sensor Activated Rinses	N,E	In ET, ST, DE, SB; Not in EP, premanufactured unmodifiable; No need in manual CU
4C-IG Timer Flow Controls	E,N	In EP; not in SBs, ET, ST, DE since sensor activated; No need in manual CU
4C-IH Conductivity Flow Controls	N	Not in EP, prefab'd unmodifiable; SB, ET,ST,DE sensor activation; No need in manual CU
4C-IIA Use in Scrubbers/Cooling Towers	N	No cooling towers, flows negligible in scrubbers
4C-IIB Reuse Process Rinsewater	N,E	In CU, ET,DE; Not in EP premanufactured unmodifiable; SB&ST, spotting & contaminatio
4C-IIC Reuse of Treated Wastewater	A	From all process lines, scheduled even though payback is greater than five years
4C-IIIA Mechanical Mixers	N	Not in EP, DE,SB, ET, ST premanufactured unmodifiable, existing CU agitation O.K.
4C-IIIB Air Agitation	E,N	In EP, CU; Not in DE, SC, ET, ST, spray rinses, no agitation needed
4C-IIIC Sonics	N	Not in EP and CU existing agitation OK; Not in DE,SC,ET,ST, spray rinses, no agitation n
4C-IIID Tank Arrangement	E,N	In EP, CU, Not in DE, SC, ET, ST, spray rinses, no agitation needed
4C-IIIE Workpiece Agitation	N	Not in EP and CU existing agitation OK; Not in DE,SC,ET,ST, spray rinses, no agitation n
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Closed loop cooling, <20 gallons of week used so negligible
5A-IB Ozonation	N	Closed loop cooling, <20 gallons of week used so negligible
5A-IC SBWR for Cooling Towers	N	Closed loop cooling, <20 gallons of week used so negligible
5A-ID Replace with Mechanical Cooling	N	Closed loop cooling, <20 gallons of week used so negligible
5A-IE Softening	N	Closed loop cooling, <20 gallons of week used so negligible
5A-II Reverse Osmosis		Did not understand that this was for reuse
5A-III High Efficiency RO	N	
5A-IV Ion Exchange		Did not understand that this was for reuse
5A-V Electrodeionization (EDI)		Did not understand that this was for reuse
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Sanmina Corp. Plant II

SJ-043A Printed Circuit Board Manufacturing

1997 Flows (gpd) 103,682 Permitted Industrial Discharge
1999 Flows (gpd) 121,326 Permitted Industrial Discharge

The study submitted had minor deficiencies that were corrected during site meetings. The studies for Sanmina I and Sanmina II were basically the same because both plants are designed with a similar layout. Sanmina has automated lines which were designed with some reasonable control measures in place; however, Sanmina also stated that the automated process line design prevented them from implementing many other reasonable control measures. There are no cooling towers at either of these facilities. One type of project was evaluated for both facilities and even though the payback was greater than 5 years, it was scheduled for implementation. The project is a wastewater treatment system that would pretreat the final effluent for reuse in manufacturing using ion exchange and deionization. It is estimated that approximately 25,000 gpd could be treated and reused in the manufacturing process at each facility. Sanmina scheduled to complete these projects by December 2000.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Recycling of treated water into process	25,299	$117,387	$6,006	19.54	12/30/00		☐
Total for All Projects		**25,299**	***gpd***					
Total for <5 Year Payback			***gpd***					
Total for Completed Projects			***gpd***					

Sanmina Corp. Plant II

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	Insignificant irrigation gpd (<1000 gpd), location of WW Treatment makes it impractical
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	Pumps use mechanical seals
4A-IVA Process Wastewater for Pumps	N	
4A-IVB SBWR for Pumps	N	
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boilers
4B-IIA Maximize Cycles of Concentration	E	Closed loop chiller uses < 20 gallons per week
4B-IIB Reuse RO Reject or Process Wastewater	N	Closed loop chiller uses < 20 gallons per week
4B-IIIA Reuse Scrubber Wastewater	N	Negligible water use
4B-IIIB Reuse Process Wastewater	N	Negligible water use
4B-IIIC SBWR for Scrubbers	N	SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	E	
4C-IB Counter Current Rinses	E	
4C-IC Spray Rinse Systems	N,E	Not in EP since premanufactured unmodifiable, 4C-IA and IB replace in manual CU
4C-ID Spray Rinse/Evap Makeup Sytems	N	Not in EP, DE premanufactured unmodifiable; redundant in SB, ET, ST; bath dilution in
4C-IE Oversprays/Foggers	N	Not in EP, DE premanufactured unmodifiable; redundant in SB, ET, ST; bath dilution in
4C-IF Sensor Activated Rinses	N,E	In ET, ST, DE, SB; Not in EP, premanufactured unmodifiable; No need in manual CU
4C-IG Timer Flow Controls	E,N	In EP; not in SBs, ET, ST, DE since sensor activated; No need in manual CU
4C-IH Conductivity Flow Controls	N	Not in EP, prefab'd unmodifiable; SB, ET,ST,DE sensor activation; No need in manual CU
4C-IIA Use in Scrubbers/Cooling Towers	N	No cooling towers, flows negligible in scrubbers
4C-IIB Reuse Process Rinsewater	N,E	In CU, ET,DE; Not in EP premanufactured unmodifiable; SB&ST, spotting & contaminatio
4C-IIC Reuse of Treated Wastewater	A	Applicable for all process lines, scheduled even though payback is greater than five years
4C-IIIA Mechanical Mixers	N	Not in EP, DE,SB, ET, ST premanufactured unmodifiable, existing CU agitation O.K.
4C-IIIB Air Agitation	E,N	In EP, CU; Not in DE, SC, ET, ST, spray rinses, no agitation needed
4C-IIIC Sonics	N	Not in EP and CU existing agitation OK; Not in DE,SC,ET,ST, spray rinses, no agitation n
4C-IIID Tank Arrangement	E,N	In EP, CU, Not in DE, SC, ET, ST, spray rinses, no agitation needed
4C-IIIE Workpiece Agitation	N,E	Not in EP and CU existing agitation OK; Not in DE,SC,ET,ST, spray rinses, no agitation n
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Closed loop cooling, <20 gallons of week used so negligible
5A-IB Ozonation	N	Closed loop cooling, <20 gallons of week used so negligible
5A-IC SBWR for Cooling Towers	N	Closed loop cooling, <20 gallons of week used so negligible, SBWR not available
5A-ID Replace with Mechanical Cooling	N	Closed loop cooling, <20 gallons of week used so negligible
5A-IE Softening	N	Closed loop cooling, <20 gallons of week used so negligible
5A-II Reverse Osmosis	N	Did not understand that this was for reuse
5A-III High Efficiency RO	N	Did not understand that this was for reuse
5A-IV Ion Exchange	N	Did not understand that this was for reuse
5A-V Electrodeionization (EDI)	N	Did not understand that this was for reuse

Additional Measures Assessed (if any)

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Santa Clara County, Elmwood Correctional Facility

MI-ELMW Institutional: Correctional

1997 Flows (gpd)	140,075	Annual Water Consumption (excluding irrigation)
1999 Flows (gpd)	159,437	Annual Water Consumption (excluding irrigation)

The Santa Clara County Elmwood Jail is a correctional facility. After several meetings and a comment letter the jail completed its Audit.

Sources and uses of water were grouped and illustrated in a series of 6 process block flow diagrams. Since inmates need special toilets to prevent clogging, ULF toilets and urinals were evaluated for jail employees only. Showerhead replacements were evaluated for both employees and inmates. These showerheads and a faucet flow control/timer for the pot wash in the cafeteria were determined to be cost effective. The project startup dates were yet to be determined.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Shower Head Replacement	2,965	$42,693	$11,892	3.59	TBD	Implementation schedule to be determined	☐
2	Urinals Replacement	980	$34,039	$1,687	20.18			☐
3	Toilet Replacement	4,200	$75,030	$7,220	10.39			☐
5	Cafeteria Pot Wash Restrictors/Timers	1,344	$1,295	$2,307	0.56	TBD	Implementation schedule to be determined	☐
6	Faucet Spring Load	1,800	$30,368	$1,453	20.90			☐

Total for All Projects	**11,289**	*gpd*
Total for <5 Year Payback	**4,309**	*gpd*
Total for Completed Projects		*gpd*

Santa Clara County, Elmwood Correctional Facility

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	Replace of non-inmate toilets and urinals, faucets with aerators, inmate fixtures built for a
4A-IB Aerators Retrofit	>5	Replace of non-inmate aerators, inmate fixtures built for inmate abuse
4A-IC Showerhead Replacement	A	Replace of non-inmate showerheads, inmate fixtures built for inmate abuse, schedule TB
4A-IIA Process Wastewater for Irrigation	N	No process water suitable for reuse
4A-IIB SBWR for Irrigation	A	Although not included in FAS, SBWR is working with the jails offline.
4A-IIIA Mechanical Seals	N	No pumps requiring seals
4A-IIIB Process Wastewater for Seals	N	No pumps requiring seals
4A-IVA Process Wastewater for Pumps	N	No pumps requiring seals
4A-IVB SBWR for Pumps	N	No pumps requiring seals
4A-VA Statistical Process Control	N	No processes
4A-VB Inspection/Maintenance	A	Not summarized or scheduled
4A-VC Employee Training	A	Not summarized or scheduled
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boilers
4B-IIA Maximize Cycles of Concentration	N	No cooling towers
4B-IIB Reuse RO Reject or Process Wastewater	N	No process water
4B-IIIA Reuse Scrubber Wastewater	N	No scrubber
4B-IIIB Reuse Process Wastewater	N	No scrubber
4B-IIIC SBWR for Scrubbers	N	No scrubber
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	No cooling towers
5A-IB Ozonation	N	No cooling towers
5A-IC SBWR for Cooling Towers	N	No cooling towers
5A-ID Replace with Mechanical Cooling	N	No cooling towers
5A-IE Softening	N	No cooling towers
5A-II Reverse Osmosis	X	No process water of sufficient quality for reuse due to homeless laundering
5A-III High Efficiency RO	X	No process water of sufficient quality for reuse due to homeless laundering
5A-IV Ion Exchange	X	No process water of sufficient quality for reuse due to homeless laundering
5A-V Electrodeionization (EDI)	X	No process water of sufficient quality for reuse due to homeless laundering

Additional Measures Assessed (if any)

Pot wash timer/controls

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Santa Clara County, Main County Jail

SJ-MAIN Institutional: Correctional

1997 Flows (gpd)	166,751	Annual Water Consumption (SSUC)
1999 Flows (gpd)	140,452	Annual Water Consumption (SSUC)

The Santa Clara County Main Jail is a correctional facility. They have applied for an IU Permit as a Tier 1 critical user. After several meetings and a comment letter the jail completed its Audit.

Sources and uses of water were grouped and illustrated in a series of six process block flow diagrams. Since inmates need special toilets to prevent clogging, ULF toilets and urinals were evaluated for jail employees only. Showerhead replacements were evaluated for both employees and inmates and determined to above a five-year payback. Faucet timers for the pot wash in the cafeteria and increasing cycles of concentration at cooling tower operations were also determined to be cost effective. Project startup dates were yet to be determined. Although irrigation with SBWR recycled water was not included in the Audit, off-line efforts with SBWR to connect them are already in place.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Replace Showerheads	1,092	$8,537	$1,563	5.46			☐
2	Flushometer and Urinal replacement	560	$39,378	$806	48.86			☐
3	Toilet Replacement	2,088	$32,065	$2,933	10.93			☐
5	Pot Wash Timers/Controls	1,520	$1,294	$2,173	0.60	TBD	Implementation schedule to be determined	☐
6	Cooling Tower Optimization to 5 cycles	1,974	$39,773	$12,538	3.17	TBD	Implementation schedule to be determined	☐

Total for All Projects	**7,234**	*gpd*
Total for <5 Year Payback	**3,494**	*gpd*
Total for Completed Projects		*gpd*

Santa Clara County, Main County Jail

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	Replace of non-inmate toilets and urinals, inmate fixtures built for inmate abuse
4A-IB Aerators Retrofit	>5	Replace of non-inmate aerators, inmate fixtures built for inmate abuse
4A-IC Showerhead Replacement	>5	Replace of non-inmate showerhead, inmate fixtures built for inmate abuse
4A-IIA Process Wastewater for Irrigation	N	No process water suitable for reuse
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	N	No pumps requiring seals
4A-IIIB Process Wastewater for Seals	N	No pumps requiring seals
4A-IVA Process Wastewater for Pumps	N	No pumps requiring seals
4A-IVB SBWR for Pumps	N	No pumps requiring seals
4A-VA Statistical Process Control	N	Not a process operation
4A-VB Inspection/Maintenance	A	
4A-VC Employee Training	A	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Closed loop boiler, no process water suitable for reuse
4B-IIA Maximize Cycles of Concentration	A	Schedule to be determined
4B-IIB Reuse RO Reject or Process Wastewater	N	No process water suitable for reuse
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Not feasible (no explanation why)
5A-IB Ozonation	N	Not feasible (no explanation why)
5A-IC SBWR for Cooling Towers	N	Not feasible (no explanation why)
5A-ID Replace with Mechanical Cooling	N	SBWR not available
5A-IE Softening	N	No beneficial effect (no explanation why)
5A-II Reverse Osmosis	X	No process water
5A-III High Efficiency RO	X	No process water
5A-IV Ion Exchange	X	No process water
5A-V Electrodeionization (EDI)	X	No process water

Additional Measures Assessed (if any)

Pot wash flow timers, schedule to be determined

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Santa Clara University

SC-UNIV Institutional: Educational

1997 Flows (gpd)	203,395	Annual Water Consumption (excluding landscape)
1999 Flows (gpd)	286,748	

Santa Clara University is a private university. The Audit for SCU was incomplete. Although Santa Clara University evaluated the flow reduction RCMs and their applicability, a cost-benefit analysis of each applicable RCM was not provided. Also, an evaluation of the cooling towers on the Santa Clara University campus was not completed.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
	Toilets, urinals and lavatory fixtures	0	$0	$0	0.00	TBD	On an ongoing basis	☐
	SBWR for irrigation	0	$58,021	$8,497	6.83	12/00	Already started	☐

Total for All Projects	**0**	***gpd***
Total for <5 Year Payback		***gpd***
Total for Completed Projects		***gpd***

Santa Clara University

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E,A	Ongoing
4A-IB Aerators Retrofit	E,A	Ongoing
4A-IC Showerhead Replacement	E,A	Ongoing
4A-IIA Process Wastewater for Irrigation	N	No process water
4A-IIB SBWR for Irrigation	E	
4A-IIIA Mechanical Seals	N	
4A-IIIB Process Wastewater for Seals	N	
4A-IVA Process Wastewater for Pumps	N	
4A-IVB SBWR for Pumps	N	
4A-VA Statistical Process Control	N	No process water
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No process water for makeup
4B-IIA Maximize Cycles of Concentration	E	
4B-IIB Reuse RO Reject or Process Wastewater	N	No process water nor RO reject for makeup
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	
5A-IB Ozonation		
5A-IC SBWR for Cooling Towers	N	Unwilling to use SBWR water due to increased maintenance, etc. 5B-5G not completed
5A-ID Replace with Mechanical Cooling		
5A-IE Softening		
5A-II Reverse Osmosis	X	No process water
5A-III High Efficiency RO	X	No process water
5A-IV Ion Exchange	X	No process water
5A-V Electrodeionization (EDI)	X	No process water
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Santa Clara Valley Medical Center

SJ-SCVM Institutional: Hospital

1997 Flows (gpd) 294,596 Annual Water Consumption
1999 Flows (gpd) 264,594 Annual Water Consumption

The study submitted was not complete. There were mathematical errors as well as a general lack of documentation of data used to evaluate and calculate project costs. A comment letter was sent and some of the discrepancies were resolved. Most of the potential water savings at the hospital will come from optimizing their cooling towers; implementing a pump gland water recycling loop for seals; and replacing toilets, faucets and showerheads. There is an overwhelming reluctance from SCVMC to implement any significant flow reduction project in the areas previously mentioned. Benchmarking other medical facilities and developing materials on water efficiency opportunities specific to hospitals may pursuade SCVMC to reconsider. Staff will continue to work with the hospital representatives to try to provide information to help them realize greater potential water efficiencies in the future.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
01	Toilet Replacement (not including patients)	220	$20,001	$173	115.61		10 toilets per year, >5 year payback	☐
02	Sinks and Faucets		$0	$0	0.00		No flow or cost data given, not scheduled	☐
03	Showers	0	$0	$0	0.00		No flow or cost data given, not scheduled	☐
04	Cafeteria	400	$2,761	$314	8.79		>5 year payback	☐
05	Patient Care Faucets	0	$0	$0	0.00		Sink aerators considered not applicable due to OSHPD	☐
06	Patient Care Toilets	0	$0	$0	0.00		Stated as not applicable due to OSHPD objections, but OSHPD said OK	☐
07	Patient Care Restrooms and Bathtubs	0	$0	$0	0.00		Sink aerators considered not applicable due to OSHPD, but shower heads OK	☐
09	Cooling Towers	7,675	$76,277	($1,182)	-64.53		No payback	☐
10	Vacuum Pumps/Breathing Air	10,080	$15,441	$5,563	2.78	TBD		☐
11	Cart washer	0	$0	$0	0.00		Not considered applicable due to OSHPD	☐
12	Sterilizers	0	$0	$0	0.00		Not considered applicable due to OSHPD	☐
13	Employee Awareness Training	1,136	$2,293	$894	2.56	TBD		☐

Total for All Projects **19,511** ***gpd***
Total for <5 Year Payback **11,216** ***gpd***
Total for Completed Projects ***gpd***

Santa Clara Valley Medical Center

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5,N	Not in patient rooms, regulated by Title 24 - Office of State Hospital Patient Dept (OSHPD
4A-IB Aerators Retrofit	A,N	Not in patient fixtures, regulated by Title 24 by the OSHPD, not evaluated or scheduled
4A-IC Showerhead Replacement	A,N	Not in patient fixtures, regulated by Title 24 by the OSHPD, not evaluated or scheduled
4A-IIA Process Wastewater for Irrigation	N	No process water
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals		
4A-IIIB Process Wastewater for Seals	A	Will evaluate using treated process water for seals where appropriate
4A-IVA Process Wastewater for Pumps	A	Project to close loop pump seals
4A-IVB SBWR for Pumps	N	SBWR not available
4A-VA Statistical Process Control	N	No process water
4A-VB Inspection/Maintenance	E,A	Not evaluated or scheduled
4A-VC Employee Training	A	Not evaluated or scheduled
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boilers
4B-IIA Maximize Cycles of Concentration	>5	
4B-IIB Reuse RO Reject or Process Wastewater	N	No RO or process water
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	
5A-IB Ozonation	N	
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	N	
5A-IE Softening	N	
5A-II Reverse Osmosis	X	No process water
5A-III High Efficiency RO	X	No process water
5A-IV Ion Exchange	X	No process water
5A-V Electrodeionization (EDI)	X	No process water

Additional Measures Assessed (if any)

In Cafeteria upgrade dishwasher, change to manual hand washing, >5
Sterlizers not applicable, regulated by Title 24 by the OSHPD

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Seagate Technology

MI-061A Semiconductor

1997 Flows (gpd) 251,728 Permitted Industrial Discharge
1999 Flows (gpd) 263,836 Permitted Industrial Discharge

The study was completed after responding to comments provided to them. Seagate broke down the manufacturing processes by function and provided good detailed explanations in the comment section for rinse reduction RCMs. Several RCMs were existing and they did a thorough evaluation of the applicability of other RCMs, although they stated that more information needed to be collected to determine the technical feasibility and capital costs for some projects.

Seagate exercised the option not to commit to any given flow reduction project at this time, noting that when a project was funded, they would notify the City. Seagate already used RO/DI to reclaim process water. There was an issue with total organic carbon to further expand recycling of treated wastewater back to process.

In addition to including water reduction measures in many of their processes, Seagate also included two different projects designed to close-loop the facility. Since there is no limit to the amount of water used per process in a closed-looped system, the water rate recirculated given was greater than the current total water use and discharge for the existing facility. A closed-loop system would actually only use water for evaporation makeup; virtually none would be discharged. Each closed-loop project was mutually exclusive and should not be interpreted as additive or as in addition to the other projects listed.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Replacing Toilets with Ultra Low Flow Fixtures	2,489	$16,539	$2,900	5.70	TBD		☐
10	Spray Rinses	108,900	$0	$150,000	0.00	TBD	Project cost and payback need to be determined	☐
11	Wet Benches with built-in recycling	155,000	$0	$213,000	0.00	TBD	Project cost and payback need to be determined	☐
2	Reusing Process Water for Irrigation	12,672	$97,596	$39,700	2.46	TBD		☐
3	Reusing RO Reject/Process Water in Cooling Towers	29,000	$47,175	$17,345	2.72	TBD		☐
4	Counter Current Rinse Systems on Wash	28,800	$0	$35,000	0.00	TBD	Project cost and payback need to be determined	☐
5	Counter Current Rinse System on Final Clean	86,400	$0	$106,000	0.00	TBD	Project cost and payback need to be determined	☐
6	Reuse of Process Rinse Water	0	$0	$0	0.00	TBD	Project cost, annual benefit, and payback need to be determined	☐
7	Reuse of Treated Wastewater Project #1	558,000	$0	$560,000	0.00	TBD	Project cost and payback need to be determined, annual benefit similar to 4&5	☐
7a	Reuse of Treated Wastewater Project #2	558,000	$0	$200,000	0.00	TBD	Seagate indicated <1 payback, but no cost data provided.	☐
8	Air Agitation	148,600	$0	$20,000	0.00	TBD	Project cost and payback need to be determined	☐
9	Tank Arrangement	27,000	$0	$37,000	0.00	TBD	Project cost and payback need to be determined	☐

Total for All Projects	**1,714,861**	*gpd*
Total for <5 Year Payback	**41,672**	*gpd*
Total for Completed Projects		*gpd*

Seagate Technology

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	N	No showers
4A-IIA Process Wastewater for Irrigation	A	
4A-IIB SBWR for Irrigation	N	Using another process for irrigation, SBWR not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	
4A-IVA Process Wastewater for Pumps	N	
4A-IVB SBWR for Pumps	N	SBWR not available
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boilers
4B-IIA Maximize Cycles of Concentration	E	
4B-IIB Reuse RO Reject or Process Wastewater	A	
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers, SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	A	For final clean and Oliver wash, in R&Dt, will notify ESD when implemented
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	A	Still in Research and Development, will notify ESD when implemented
4C-IIC Reuse of Treated Wastewater	A	Still in Research and Development, will notify ESD when implemented
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	A	Still in Research and Development, will notify ESD when implemented
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	A	Still in Research and Development, will notify ESD when implemented
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	A	Still in Research and Development, will notify ESD when implemented
4D-IB Hot Ultra Pure	E,N	No need in texturize, keeping discs wet; nor in Oliver wash process, drying w/ centrifugal f
4D-IC Megasonic Rinsing	E	
4D-ID Spin Rinsing	E	
4D-IE Rinse Tank Geometry	A	Still in Research and Development, will notify ESD when implemented
4D-IF Idle Flow Reduction	E,N	Autohandler in texture and after ultrasonic cleaning, Oliver flushes avoids bio contaminati
4D-II Wet Benches with Built-In Recycling	A	Still in Research and Development, will notify ESD when implemented
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	E	
5A-IB Ozonation	N	
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	N	Cooling for large clean rooms would result in excessive power consumption
5A-IE Softening	N	Current water needs no additional treatment for reuse/recycle.
5A-II Reverse Osmosis	E,N	Uses a second pass RO, but did not evaluate reusing process water.
5A-III High Efficiency RO	E	
5A-IV Ion Exchange	N	TOC Concerns
5A-V Electrodeionization (EDI)	N	TOC Concerns
Additional Measures Assessed (if any)		

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Sorrento Cheese Co.

SJ-016C Other Industrial: Food Processing

1997 Flows (gpd) 217,550 Permitted Industrial Discharge
1999 Flows (gpd) 261,160 Permitted Industrial Discharge

Sorrento Cheese completed its Audit after responding to a letter sent with minor comments. Sorrento Cheese is a cheese manufacturer and therefore, must comply with strict milk production regulations to prevent contamination. These regulations prevent Sorrento Cheese from recycling process water in most applications. The method used to calculate toilet flowrates were questionable, but the flow rates provided for other processes were deemed adequate. Sorrento Cheese also already reuses some water in their processes at the few locations allowed by the milk production regulations.

Although most of the project cost data were questionable especially for the toilet installations, two projects were determined to have a five year payback or less and were implemented in 1999: replacement with steam vacuum eductors and detergent recovery.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
1	Replacing 3 Toilets with Ultra Low Flow Fixtures	112	$16,434	$1,057	15.55			☐
2	Replacing 3 Vacuum Pumps with Steam Vacuum Eductors	28,300	$63,095	$16,981	3.72	1999		☑
3	Detergent Recovery	11,747	$294,931	$55,084	5.35	1999		☑
4	Reusing Process Water for Floor Cleaning	10,000	$285,710	$24,451	11.69			☐

Total for All Projects **50,159** ***gpd***
Total for <5 Year Payback **28,300** ***gpd***
Total for Completed Projects **40,047** ***gpd***

Sorrento Cheese Co.

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	
4A-IB Aerators Retrofit	E	
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	Stormwater Agency mandates potable water
4A-IIB SBWR for Irrigation	N	SBWR unavailable
4A-IIIA Mechanical Seals	E	Also has project to replace three vacuum pumps with three steam vacuum eductors
4A-IIIB Process Wastewater for Seals	N	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
4A-IVA Process Wastewater for Pumps	N	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
4A-IVB SBWR for Pumps	N	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	Culinary steam, USDA milk processing regulations prohibit, App D of Pasteurized Milk Or
4B-IIA Maximize Cycles of Concentration	E	
4B-IIB Reuse RO Reject or Process Wastewater	N	Organic loading prohibits reusing process water
4B-IIIA Reuse Scrubber Wastewater	N	No scrubbers
4B-IIIB Reuse Process Wastewater	N	No scrubbers
4B-IIIC SBWR for Scrubbers	N	No scrubbers
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	X	
4D-IB Hot Ultra Pure	X	
4D-IC Megasonic Rinsing	X	
4D-ID Spin Rinsing	X	
4D-IE Rinse Tank Geometry	X	
4D-IF Idle Flow Reduction	X	
4D-II Wet Benches with Built-In Recycling	X	
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	E	
5A-IB Ozonation	E	
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling	E	
5A-IE Softening	E	
5A-II Reverse Osmosis	N	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
5A-III High Efficiency RO	N	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
5A-IV Ion Exchange	X	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
5A-V Electrodeionization (EDI)	X	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance

Additional Measures Assessed (if any)

Steam Vacuum Eductors
Detergent Recovery
Reuse Process water for floor cleaning, >5

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Unisil

SC-236A Semiconductor

1997 Flows (gpd)	43,584	Permitted Industrial Discharge
1999 Flows (gpd)	28,331	Permitted Industrial Discharge

Unisil grows and slices silicon wafers. As the discharger list was being compiled, this facility was combined with a neighboring one owned by the same company because water use for the two sites was intimately connected. However, after a change in ownership and during the study, it was decided that since this facility had two distinct discharge points with separate permits, the flows were to be separated and only this Audit was to be reviewed, although the flow from this facility was less than 50,000 gpd.

Although they were sent two comment letters and met with staff several times, the resulting product was confusing and incomplete. The flow data as presented was difficult to follow. No new projects were included or evaluated though some rinsing methods could have been. However, this site already implemented some of the RCMs, including reusing RO reject water in the scrubbers, reusing 25,000 gpd of DI water in the fab areas, and replacing plate washers with plate dryers.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
A	RO Reclaim to Scrubber	4,000	$2,000	$1,000	2.00	1/99		☑
B	Recycling of DI Process Water to rinses	20,000	$6,000	$3,000	2.00	2/98		☑
C	Plate Dryer versus Plate Washer	100	$2,000	$10,000	0.20	1998		☑

Total for All Projects	**24,100**	*gpd*
Total for <5 Year Payback	**24,100**	*gpd*
Total for Completed Projects	**24,100**	*gpd*

Unisil

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E,A	Partially installed, no evaluation and not scheduled in Worksheets 6 and 7
4A-IB Aerators Retrofit		
4A-IC Showerhead Replacement	E	
4A-IIA Process Wastewater for Irrigation	N	To costly to replumb system, however Worksheets 5B-5G were not completed as directed
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	
4A-IVA Process Wastewater for Pumps	E	
4A-IVB SBWR for Pumps	N	SBWR not available
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boilers
4B-IIA Maximize Cycles of Concentration	N	No cooling towers
4B-IIB Reuse RO Reject or Process Wastewater	N	No cooling towers
4B-IIIA Reuse Scrubber Wastewater	N	Already reusing RO reject
4B-IIIB Reuse Process Wastewater	E	Uses RO reject
4B-IIIC SBWR for Scrubbers	N	SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse		
4D-IB Hot Ultra Pure	E	
4D-IC Megasonic Rinsing		
4D-ID Spin Rinsing		
4D-IE Rinse Tank Geometry	E	
4D-IF Idle Flow Reduction	E	
4D-II Wet Benches with Built-In Recycling		
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	No cooling towers
5A-IB Ozonation	N	No cooling towers
5A-IC SBWR for Cooling Towers	N	No cooling towers, SBWR not available
5A-ID Replace with Mechanical Cooling	N	No cooling towers
5A-IE Softening	N	No cooling towers
5A-II Reverse Osmosis		Already does reclaim water DI water for reuse without additional treatment
5A-III High Efficiency RO	E	
5A-IV Ion Exchange		
5A-V Electrodeionization (EDI)		

Additional Measures Assessed (if any)

Replace Plate Washer with Plate Drier

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

UniSil Corp.

SC-295A Semiconductor

1997 Flows (gpd)	198,499	Permitted Industrial Discharge
1999 Flows (gpd)	205,824	Permitted Industrial Discharge

This Unisil also grows and manufactures silicon wafers. Company personnel completed most of the Audit after responding to a comment letter although a few minor details were incomplete. The flow data were broken down by function and appeared to be accurate.

Rinse reduction RCMs were deemed too expensive, but not evaluated for cost as instructed in the Audit Protocol. The evaluation of the replacement of toilets with ultra low flush fixtures was only partially completed. Response to comments was not received in time to verify cost data. The Audit should have also included an evaluation of reusing process water.

The projects evaluated and scheduled were for the reuse of RO reject into the facility's three cooling towers, three fume scrubbers, and NOX scrubbers.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
2	Replacing DI rinse water in lapping with RO reject or	12,000	$0	$0	0.00		No cost data or schedule for implementation	☐
CT #1	Reusing RO Reject in 3 Cooling Towers	18,000	$7,500	$1,875	4.00	2001		☐
CT #2	Reusing RO reject in 3 Fume Scrubbers and 1 NOX	20,000	$7,500	$1,875	4.00	2001		☐
Total for All Projects		**50,000**	***gpd***					
Total for <5 Year Payback		**38,000**	***gpd***					
Total for Completed Projects			***gpd***					

UniSil Corp.

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	E	
4A-IB Aerators Retrofit		
4A-IC Showerhead Replacement		
4A-IIA Process Wastewater for Irrigation	N	
4A-IIB SBWR for Irrigation	N	SBWR not available
4A-IIIA Mechanical Seals	E	
4A-IIIB Process Wastewater for Seals	N	
4A-IVA Process Wastewater for Pumps	A	Not evaluated or scheduled
4A-IVB SBWR for Pumps	N	SBWR not available
4A-VA Statistical Process Control	E	
4A-VB Inspection/Maintenance	E	
4A-VC Employee Training	E	
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boilers
4B-IIA Maximize Cycles of Concentration		
4B-IIB Reuse RO Reject or Process Wastewater	A	3 cooling towers
4B-IIIA Reuse Scrubber Wastewater		
4B-IIIB Reuse Process Wastewater	A	3 scrubbers and 1 NOX scrubber
4B-IIIC SBWR for Scrubbers	N	SBWR not available
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	N	Stated that old process stations are too costly to convert, although 5B-5G were not compl
4D-IB Hot Ultra Pure	N	Stated that old process stations are too costly to convert, although 5B-5G were not compl
4D-IC Megasonic Rinsing	E	
4D-ID Spin Rinsing	E	
4D-IE Rinse Tank Geometry	N	Stated that old process stations are too costly to convert, although 5B-5G were not compl
4D-IF Idle Flow Reduction	E	
4D-II Wet Benches with Built-In Recycling		
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration		
5A-IB Ozonation		
5A-IC SBWR for Cooling Towers	N	SBWR not available
5A-ID Replace with Mechanical Cooling		
5A-IE Softening		
5A-II Reverse Osmosis		
5A-III High Efficiency RO		
5A-IV Ion Exchange		
5A-V Electrodeionization (EDI)		

Additional Measures Assessed (if any)

Description
Replacing DI water in lapping with RO Reject

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Vishay - Siliconix, Inc.

SC-033A Semiconductor

1997 Flows (gpd) 336,133 Permitted Industrial Discharge
1999 Flows (gpd) 255,100 Permitted Industrial Discharge

The study submitted in June 1999 was not complete. Discrepancies in the document were eventually resolved. Additional information was requested to verify some project costs and calculations used. In particular, the costs for replacing toilets were questioned. The manufacturing process (fab) was not detailed. Most of the reasonable control measures were deemed applicable or existing.

Five projects were identified as having a payback of 5 years or less. While no schedule for implementing projects was provided, Vishay-Siliconix has implemented their cooling tower optimization project, the fab water conservation effort, and the closure of Fab 2. They are also 80% complete on a water reuse project, not included in their project list, which will reuse approximately 60,000 gallons per day of RO reject water in their cooling towers and/or scrubbers. This project is scheduled to be completed by the end of summer 2000.

FAS Projects Summary

#	Description	Chg in Flow (gpd)	Capital Cost	Annual Benefit	Payback (Years)	Completion Date	Comments	Done
01	SBWR for irrigation	0	$27,113	$1,212	22.37		>5 year payback	☐
02	Replace toilets/urinals with ultra-low flow fixtures	6,264	$320,894	$5,237	61.27		>5 year payback	☐
03	Alternate Scrubber Supply	63,360	$174,219	$58,445	2.98	TBD	Cost Recalculated by ESD	☐
04	Optimize Control on Cooling Towers/Humidifiers	12,556	$82,163	$28,731	2.86	TBD	Cost Recalculated by ESD	☑
05	2nd stage RO	33,000	$207,590	$19,814	10.48	TBD	>5 year payback. Cost Recalculated by ESD	☐
06	Water conservation in Fab	73,200	$40,376	$131,969	0.31	TBD		☑
08	Add aerators/restrictors to faucets	1,350	$5,108	$1,063	4.81	TBD		☐
09	Liquid Ring Vacuum Pump Water Recycle	3,888	$6,066	$7,281	0.83	TBD	Cost Recalculated by ESD	☐
10	Pump gland water recycle	2,160	$11,357	$1,702	6.67		>5 year payback. Cost Recalculated by ESD	☐

Total for All Projects **195,778** ***gpd***
Total for <5 Year Payback **154,354** ***gpd***
Total for Completed Projects **85,756** ***gpd***

Vishay - Siliconix, Inc.

FAS Measures Review

Measure	*Assessment of Measure and Notes*	
General Facility RCMs		
4A-IA Toilet Retofit	>5	
4A-IB Aerators Retrofit	A	Schedule to be determined
4A-IC Showerhead Replacement	A	Not scheduled, may be part of aerators retrofit
4A-IIA Process Wastewater for Irrigation	N	Process water quality inadequate
4A-IIB SBWR for Irrigation	>5	Working with the City of Santa Clara to bring down to cost.
4A-IIIA Mechanical Seals	E,A	Applicable seal replacement not scheduled or evaluated in Worksheets 5-7
4A-IIIB Process Wastewater for Seals	>5	Project to close loop pump seals
4A-IVA Process Wastewater for Pumps	A	Per Comments, no pumps of this type, but there is project to close loop liquid ring vacuu
4A-IVB SBWR for Pumps	N	Per Comments, no pumps of this type, but there's a project to close loop liquid ring vacuu
4A-VA Statistical Process Control	E,A	Will be evaluated for DI/CT/AWN, schedule to be determined
4A-VB Inspection/Maintenance	E,A	PM rounds ensure consistent operation, schedule to be determined
4A-VC Employee Training	E,A	Standard operator traiing, schedule to be determined
HVAC and Scrubber RCMs		
4B-IA Process Wastewater for Boiler Make-up	N	No boilers
4B-IIA Maximize Cycles of Concentration	E,A	Using from 5 to 8 cycles of concentration
4B-IIB Reuse RO Reject or Process Wastewater	A	Schedule to be determined
4B-IIIA Reuse Scrubber Wastewater	A	Schedule to be determined
4B-IIIB Reuse Process Wastewater	A	Schedule to be determined
4B-IIIC SBWR for Scrubbers	A	Needs pipeline extension to facility
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses		
4C-IA Flow Restrictors and Manual Flow Controls	X	
4C-IB Counter Current Rinses	X	
4C-IC Spray Rinse Systems	X	
4C-ID Spray Rinse/Evap Makeup Sytems	X	
4C-IE Oversprays/Foggers	X	
4C-IF Sensor Activated Rinses	X	
4C-IG Timer Flow Controls	X	
4C-IH Conductivity Flow Controls	X	
4C-IIA Use in Scrubbers/Cooling Towers	X	
4C-IIB Reuse Process Rinsewater	X	
4C-IIC Reuse of Treated Wastewater	X	
4C-IIIA Mechanical Mixers	X	
4C-IIIB Air Agitation	X	
4C-IIIC Sonics	X	
4C-IIID Tank Arrangement	X	
4C-IIIE Workpiece Agitation	X	
RCMs for Semi-Conductor Industry		
4D-IA Spray Rinse	E,A	Schedule to be determined
4D-IB Hot Ultra Pure	N	Negative product quality impact
4D-IC Megasonic Rinsing	E,A	Used in process where appropriate, schedule to be determined
4D-ID Spin Rinsing	E,A	Used in process where appropriate, schedule to be determined
4D-IE Rinse Tank Geometry	N	Cannot change cassettes/wafer handling
4D-IF Idle Flow Reduction	A	Schedule to be determined
4D-II Wet Benches with Built-In Recycling	A	Evaluated as sinks are replaced
Potential Cost Effective Flow Reduction Measures		
5A-IA Sidestream Filtration	N	Uses standard Cooling Tower Technology
5A-IB Ozonation	A	Not evaluated or scheduled
5A-IC SBWR for Cooling Towers	N	Would increase cooling tower blowdown/ decrease Bay discharge
5A-ID Replace with Mechanical Cooling	N	High cost, no space
5A-IE Softening	A	Schedule to be determined
5A-II Reverse Osmosis	N, >5	Evaluating 2nd pass RO for RO reject
5A-III High Efficiency RO	E	
5A-IV Ion Exchange	N	Not a cooling or HPW technology
5A-V Electrodeionization (EDI)	N	Too expensive (not evaluated for costs in S5), non-standard technology

Additional Measures Assessed (if any)

Pump gland recycle >5
Close loop Liquid Ring Vacuum Pump

Assessment Key:
A = Applicable E = Existing N = Not Applicable >5 = Payback greater than 5 years X = Not Required for this Sector

Appendix C: Audit Measures Matrices

The following matrices include how each company assessed the Audit measures using the key below. Company responses are separated by sector to illustrate how responses from similar participants compare.

Assessment Key:

A = Applicable

E = Existing

N = Not Applicable

>5 = Payback greater than 5 years

X = Not Required for this Sector

Audit Measures Matrix by Sector

Semiconductor	Analog Devices, PMI Division	Hewlett Packard	Intel Corporation D2P3	Intel Corporation, D2	Linear Technology	Lockheed Martin Fairchild Systems	LSI Logic
Permit #	SC-060A	SJ-003A	SC-249A	SC-028A	MI-006A	MI-072A	SC-046A
General Facility RCMs							
4A-IA Toilet Retofit	A	A	E	E	E,>5	>5	>5
4A-IB Aerators Retrofit	A	E	E	E	E	E	E
4A-IC Showerhead Replacement	E	A	E	E	E	A	E
4A-IIA Process Wastewater for Irrigation	N	N	N	N	N	N	N
4A-IIB SBWR for Irrigation	N	N	A	A	E	E	N
4A-IIIA Mechanical Seals	E	E	E	E	E	E	N
4A-IIIB Process Wastewater for Seals	N	N	N	N	N	N	N
4A-IVA Process Wastewater for Pumps	N	N	N	N	E	N	N
4A-IVB SBWR for Pumps	N	N	N	N	N	N	N
4A-VA Statistical Process Control	E	E	E	E	E	N	E
4A-VB Inspection/Maintenance	E	E	E	E	E	E	E
4A-VC Employee Training	A	E	E	E	E	A	E
HVAC and Scrubber RCMs							
4B-IA Process Wastewater for Boiler Make-up	N	N	N	N	N	N	N
4B-IIA Maximize Cycles of Concentration	N	E	N	N	E	E	E
4B-IIB Reuse RO Reject or Process Wastewater	N	N	A	A	E	E	>5
4B-IIIA Reuse Scrubber Wastewater	N	N	N	N	N	E	N
4B-IIIB Reuse Process Wastewater	A	E,A	N	N	E	E	>5
4B-IIIC SBWR for Scrubbers	N	N	N	N	N	N	N
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses							
4C-IA Flow Restrictors and Manual Flow Controls	E	X	X	E	X	X	X
4C-IB Counter Current Rinses	N	X	X	N	X	X	X
4C-IC Spray Rinse Systems	E	X	X	E	X	X	X
4C-ID Spray Rinse/Evap Makeup Sytems	X	X	X	N	X	X	X
4C-IE Oversprays/Foggers	X	X	X	N	X	X	X
4C-IF Sensor Activated Rinses	E	X	X	E	X	X	X
4C-IG Timer Flow Controls	E	X	X	E	X	X	X
4C-IH Conductivity Flow Controls	E	X	X	N	X	X	X
4C-IIA Use in Scrubbers/Cooling Towers	A	X	X	N	X	X	X
4C-IIB Reuse Process Rinsewater	A	X	X	E	X	X	X
4C-IIC Reuse of Treated Wastewater	N	X	X	N	X	X	X
4C-IIIA Mechanical Mixers	N	X	X	E	X	X	X
4C-IIIB Air Agitation	E	X	X	N	X	X	X
4C-IIIC Sonics	E	X	X	N	X	X	X
4C-IIID Tank Arrangement	E	X	X	E	X	X	X
4C-IIIE Workpiece Agitation	E	X	X	N	X	X	X
RCMs for Semiconductor Industry							
4D-IA Spray Rinse	N	E	E	E	E	N	E,N
4D-IB Hot Ultra Pure	A	E	E	E	E	N	E
4D-IC Megasonic Rinsing	A	N	E	E	E	N	N
4D-ID Spin Rinsing	E	E	E	E	E	N	E,N
4D-IE Rinse Tank Geometry	N	E,A	E	E	E	E	E,N
4D-IF Idle Flow Reduction	E	A	E	E	E	E	E,A,N
4D-II Wet Benches with Built-In Recycling	A	N	E	E	E	N	E,N
Potential Cost Effective Flow Reduction Measures							
5A-IA Sidestream Filtration	N	E	N	N	E	N	E
5A-IB Ozonation	N	N	N	N	E	N	N
5A-IC SBWR for Cooling Towers	N	N	N	N	A	N	N
5A-ID Replace with Mechanical Cooling	N	E	N	N	N	N	E
5A-IE Softening	N	E	E	E	N	N	E
5A-II Reverse Osmosis	E		N		N	N	
5A-III High Efficiency RO	N		E	E	E	N	A
5A-IV Ion Exchange	N		N		N	N	
5A-V Electrodeionization (EDI)	N	A	N		N	N	N

Audit Measures Matrix by Sector

Semiconductor	Micrel Inc.	Seagate Technology	Unisil	UniSil Corp.	Vishay - Siliconix, Inc.
Permit #	SJ-258A	MI-061A	SC-236A	SC-295A	SC-033A
General Facility RCMs					
4A-IA Toilet Retofit	>5	>5	E,A	E	>5
4A-IB Aerators Retrofit	>5	E			A
4A-IC Showerhead Replacement	>5	N	E		A
4A-IIA Process Wastewater for Irrigation	N	A	N	N	N
4A-IIB SBWR for Irrigation	N	N	N	N	>5
4A-IIIA Mechanical Seals	E	E	E	E	E,A
4A-IIIB Process Wastewater for Seals	N	N	N	N	>5
4A-IVA Process Wastewater for Pumps	N	N	E	A	A
4A-IVB SBWR for Pumps	N	N	N	N	N
4A-VA Statistical Process Control	N	E	E	E	E,A
4A-VB Inspection/Maintenance	A	E	E	E	E,A
4A-VC Employee Training	E	E	E	E	E,A
HVAC and Scrubber RCMs					
4B-IA Process Wastewater for Boiler Make-up	N	N	N	N	N
4B-IIA Maximize Cycles of Concentration	A	E	N		E,A
4B-IIB Reuse RO Reject or Process Wastewater	N	A	N	A	A
4B-IIIA Reuse Scrubber Wastewater	N	N	N		A
4B-IIIB Reuse Process Wastewater	>5	N	E	A	A
4B-IIIC SBWR for Scrubbers	N	N	N	N	A
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses					
4C-IA Flow Restrictors and Manual Flow Controls	X	X	X	X	X
4C-IB Counter Current Rinses	X	A	X	X	X
4C-IC Spray Rinse Systems	X	X	X	X	X
4C-ID Spray Rinse/Evap Makeup Sytems	X	X	X	X	X
4C-IE Oversprays/Foggers	X	X	X	X	X
4C-IF Sensor Activated Rinses	X	X	X	X	X
4C-IG Timer Flow Controls	X	X	X	X	X
4C-IH Conductivity Flow Controls	X	X	X	X	X
4C-IIA Use in Scrubbers/Cooling Towers	X	X	X	X	X
4C-IIB Reuse Process Rinsewater	X	A	X	X	X
4C-IIC Reuse of Treated Wastewater	X	A	X	X	X
4C-IIIA Mechanical Mixers	X	X	X	X	X
4C-IIIB Air Agitation	X	A	X	X	X
4C-IIIC Sonics	X	X	X	X	X
4C-IIID Tank Arrangement	X	A	X	X	X
4C-IIIE Workpiece Agitation	X	X	X	X	X
RCMs for Semiconductor Industry					
4D-IA Spray Rinse	A	A		N	E,A
4D-IB Hot Ultra Pure	N	E,N	E	N	N
4D-IC Megasonic Rinsing	E	E		E	E,A
4D-ID Spin Rinsing	E	E		E	E,A
4D-IE Rinse Tank Geometry	N	A	E	N	N
4D-IF Idle Flow Reduction	A	E,N	E	E	A
4D-II Wet Benches with Built-In Recycling	A	A			A
Potential Cost Effective Flow Reduction Measures					
5A-IA Sidestream Filtration	N	E	N		N
5A-IB Ozonation	N	N	N		A
5A-IC SBWR for Cooling Towers	N	N	N	N	N
5A-ID Replace with Mechanical Cooling	N	N	N		N
5A-IE Softening	A	N	N		A
5A-II Reverse Osmosis	E,N	E,N			N, >5
5A-III High Efficiency RO	E	E	E		E
5A-IV Ion Exchange	N	N			N
5A-V Electrodeionization (EDI)	N	N			N

Audit Measures Matrix by Sector

Printed Circuit Board Manufacturers	Dynamic Details	HADCO	Sanmina Corp. Plant I	Sanmina Corp. Plant II
Permit #	MI-014A	SC-027A	SJ-022A	SJ-043A
General Facility RCMs				
4A-IA Toilet Retofit	A	A	E	E
4A-IB Aerators Retrofit	A	E	E	E
4A-IC Showerhead Replacement	N	A	E	E
4A-IIA Process Wastewater for Irrigation	N	N	N	N
4A-IIB SBWR for Irrigation	N	N	N	N
4A-IIIA Mechanical Seals	N	E	E	E
4A-IIIB Process Wastewater for Seals	N	N	N	N
4A-IVA Process Wastewater for Pumps	N	E	N	N
4A-IVB SBWR for Pumps	N	N	N	N
4A-VA Statistical Process Control	E	E	E	E
4A-VB Inspection/Maintenance	E	E	E	E
4A-VC Employee Training	E	A	E	E
HVAC and Scrubber RCMs				
4B-IA Process Wastewater for Boiler Make-up	N	N	N	N
4B-IIA Maximize Cycles of Concentration	E	N	E	E
4B-IIB Reuse RO Reject or Process Wastewater	N	N	N	N
4B-IIIA Reuse Scrubber Wastewater	N	E	N	N
4B-IIIB Reuse Process Wastewater	E	N	N	N
4B-IIIC SBWR for Scrubbers	N	N	N	N
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses				
4C-IA Flow Restrictors and Manual Flow Controls	E,N	E,A	E	E
4C-IB Counter Current Rinses	E,N	E,N	E	E
4C-IC Spray Rinse Systems	E,N	E,N	N,E	N,E
4C-ID Spray Rinse/Evap Makeup Sytems	E,N	E,N	N	N
4C-IE Oversprays/Foggers	N	N	N	N
4C-IF Sensor Activated Rinses	E, N,A	E,N	N,E	N,E
4C-IG Timer Flow Controls	E,N,A	E,N	E,N	E,N
4C-IH Conductivity Flow Controls	N	E,A,N	N	N
4C-IIA Use in Scrubbers/Cooling Towers	N	N	N	N
4C-IIB Reuse Process Rinsewater	E,N	E,N	N,E	N,E
4C-IIC Reuse of Treated Wastewater	E,N	E,N	A	A
4C-IIIA Mechanical Mixers	E, N	N	N	N
4C-IIIB Air Agitation	N,A,E	E,N	E,N	E,N
4C-IIIC Sonics	N	N	N	N
4C-IIID Tank Arrangement	E,N	E,A,N	E,N	E,N
4C-IIIE Workpiece Agitation	N,A,E	E,N	N	N,E
RCMs for Semiconductor Industry				
4D-IA Spray Rinse	X	X	X	X
4D-IB Hot Ultra Pure	X	X	X	X
4D-IC Megasonic Rinsing	X	X	X	X
4D-ID Spin Rinsing	X	X	X	X
4D-IE Rinse Tank Geometry	X	X	X	X
4D-IF Idle Flow Reduction	X	X	X	X
4D-II Wet Benches with Built-In Recycling	X	X	X	X
Potential Cost Effective Flow Reduction Measures				
5A-IA Sidestream Filtration	N	N	N	N
5A-IB Ozonation	N	N	N	N
5A-IC SBWR for Cooling Towers	N	N	N	N
5A-ID Replace with Mechanical Cooling	N	N	N	N
5A-IE Softening	N	N	N	N
5A-II Reverse Osmosis	A			N
5A-III High Efficiency RO	N	E	N	N
5A-IV Ion Exchange	E			N
5A-V Electrodeionization (EDI)	N	N		N

Audit Measures Matrix by Sector

Disk/Head Manufacturers	IBM Corporation	Komag Inc. Bldg 10	Read-Rite Corp.
Permit #	SJ-007A	SJ-341A	MI-004A
General Facility RCMs			
4A-IA Toilet Retofit	E,A	E	E
4A-IB Aerators Retrofit	E	E	E
4A-IC Showerhead Replacement	E	N	N
4A-IIA Process Wastewater for Irrigation	>5	N	A
4A-IIB SBWR for Irrigation	N	N	N
4A-IIIA Mechanical Seals	E	N	N
4A-IIIB Process Wastewater for Seals	A	N	N
4A-IVA Process Wastewater for Pumps	E,A	N	N
4A-IVB SBWR for Pumps	N	N	N
4A-VA Statistical Process Control	E	E	N
4A-VB Inspection/Maintenance	E	E	E
4A-VC Employee Training	E	E	A
HVAC and Scrubber RCMs			
4B-IA Process Wastewater for Boiler Make-up	N	N	N
4B-IIA Maximize Cycles of Concentration	E	E	A
4B-IIB Reuse RO Reject or Process Wastewater	E	E	N
4B-IIIA Reuse Scrubber Wastewater	N	N	N
4B-IIIB Reuse Process Wastewater	E	N	N
4B-IIIC SBWR for Scrubbers	N	N	N
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses			
4C-IA Flow Restrictors and Manual Flow Controls	E	E,N	X
4C-IB Counter Current Rinses	N,E	E,N	X
4C-IC Spray Rinse Systems	E	E,N	X
4C-ID Spray Rinse/Evap Makeup Sytems	N	N	X
4C-IE Oversprays/Foggers	N	E,N	X
4C-IF Sensor Activated Rinses	E,N	E,N	X
4C-IG Timer Flow Controls	E	E,N	X
4C-IH Conductivity Flow Controls	E	N	X
4C-IIA Use in Scrubbers/Cooling Towers	E	E,N	X
4C-IIB Reuse Process Rinsewater	N	E, N	X
4C-IIC Reuse of Treated Wastewater	N	N	X
4C-IIIA Mechanical Mixers	N	E,N	X
4C-IIIB Air Agitation	N	N	X
4C-IIIC Sonics	E	E,N	X
4C-IIID Tank Arrangement	E	E,N	X
4C-IIIE Workpiece Agitation	E	E,N	X
RCMs for Semiconductor Industry			
4D-IA Spray Rinse	E	E	E
4D-IB Hot Ultra Pure	N	N	E
4D-IC Megasonic Rinsing	E,N	N	E
4D-ID Spin Rinsing	E,N	N	E
4D-IE Rinse Tank Geometry	E,N	E	N
4D-IF Idle Flow Reduction	E,N	E	N
4D-II Wet Benches with Built-In Recycling	N	N	N
Potential Cost Effective Flow Reduction Measures			
5A-IA Sidestream Filtration	N	N	N
5A-IB Ozonation	N	N	N
5A-IC SBWR for Cooling Towers	N	N	N
5A-ID Replace with Mechanical Cooling	N	N	N
5A-IE Softening	N	N	N
5A-II Reverse Osmosis	N,>5	N	N
5A-III High Efficiency RO	N	E	N
5A-IV Ion Exchange	N,>5	N	N
5A-V Electrodeionization (EDI)	N	N	N

Audit Measures Matrix by Sector

Other Industrial	Sorrento Cheese Co.	Exchange Linen Services	California Paperboard Corp.	Jefferson Smurfit
Permit #	SJ-016C	SJ-022C	SC-005C	SC-003C
General Facility RCMs				
4A-IA Toilet Retofit	>5	E,A	E	A
4A-IB Aerators Retrofit	E	E,A	E	A
4A-IC Showerhead Replacement	E	A	A	A
4A-IIA Process Wastewater for Irrigation	N	N	N	N
4A-IIB SBWR for Irrigation	N	N	A	A
4A-IIIA Mechanical Seals	E	E	A	E
4A-IIIB Process Wastewater for Seals	N	N	N	E
4A-IVA Process Wastewater for Pumps	N	N	E	E
4A-IVB SBWR for Pumps	N	N	N	N
4A-VA Statistical Process Control	E	E	A	E
4A-VB Inspection/Maintenance	E	E	E,A	E
4A-VC Employee Training	E	E	E	E
HVAC and Scrubber RCMs				
4B-IA Process Wastewater for Boiler Make-up	N	N	N	N
4B-IIA Maximize Cycles of Concentration	E	N	N	E
4B-IIB Reuse RO Reject or Process Wastewater	N	N	N	N
4B-IIIA Reuse Scrubber Wastewater	N	E	N	N
4B-IIIB Reuse Process Wastewater	N	N	N	N
4B-IIIC SBWR for Scrubbers	N	N	N	N
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses				
4C-IA Flow Restrictors and Manual Flow Controls	X	X	X	X
4C-IB Counter Current Rinses	X	X	X	X
4C-IC Spray Rinse Systems	X	X	X	X
4C-ID Spray Rinse/Evap Makeup Sytems	X	X	X	X
4C-IE Oversprays/Foggers	X	X	X	X
4C-IF Sensor Activated Rinses	X	X	X	X
4C-IG Timer Flow Controls	X	X	X	X
4C-IH Conductivity Flow Controls	X	X	X	X
4C-IIA Use in Scrubbers/Cooling Towers	X	X	X	X
4C-IIB Reuse Process Rinsewater	X	X	X	X
4C-IIC Reuse of Treated Wastewater	X	X	X	X
4C-IIIA Mechanical Mixers	X	X	X	X
4C-IIIB Air Agitation	X	X	X	X
4C-IIIC Sonics	X	X	X	X
4C-IIID Tank Arrangement	X	X	X	X
4C-IIIE Workpiece Agitation	X	X	X	X
RCMs for Semiconductor Industry				
4D-IA Spray Rinse	X	X	X	X
4D-IB Hot Ultra Pure	X	X	X	X
4D-IC Megasonic Rinsing	X	X	X	X
4D-ID Spin Rinsing	X	X	X	X
4D-IE Rinse Tank Geometry	X	X	X	X
4D-IF Idle Flow Reduction	X	X	X	X
4D-II Wet Benches with Built-In Recycling	X	X	X	X
Potential Cost Effective Flow Reduction Measures				
5A-IA Sidestream Filtration	E	N	N	E
5A-IB Ozonation	E	N	N	A
5A-IC SBWR for Cooling Towers	N	N	N	N
5A-ID Replace with Mechanical Cooling	E	N	N	E
5A-IE Softening	E	N	N	A
5A-II Reverse Osmosis	N	X	N	E
5A-III High Efficiency RO	N	X	N	N
5A-IV Ion Exchange	X	X	X	X
5A-V Electrodeionization (EDI)	X	X	X	X

Audit Measures Matrix by Sector

Commercial	Doubletree Hotel	Fairmont Hotel	Paramount Great America
Permit #	SJ-DOUB	SJ-FAIR	SC-PARA

General Facility RCMs

4A-IA Toilet Retofit	E,>5,A	>5	>5
4A-IB Aerators Retrofit	E	E	A
4A-IC Showerhead Replacement	E	E	E
4A-IIA Process Wastewater for Irrigation	N	N	E
4A-IIB SBWR for Irrigation	N	N	E
4A-IIIA Mechanical Seals	E	E	N
4A-IIIB Process Wastewater for Seals	N	N	>5
4A-IVA Process Wastewater for Pumps	N	N	N
4A-IVB SBWR for Pumps	N	N	N
4A-VA Statistical Process Control	N	N	N
4A-VB Inspection/Maintenance	E	E	E
4A-VC Employee Training	E	E	E

HVAC and Scrubber RCMs

4B-IA Process Wastewater for Boiler Make-up	N	N	N
4B-IIA Maximize Cycles of Concentration	>5	A	N
4B-IIB Reuse RO Reject or Process Wastewater	N	N	N
4B-IIIA Reuse Scrubber Wastewater	N	N	N
4B-IIIB Reuse Process Wastewater	N	N	N
4B-IIIC SBWR for Scrubbers	N	N	N

Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses

4C-IA Flow Restrictors and Manual Flow Controls	X	X	X
4C-IB Counter Current Rinses	X	X	X
4C-IC Spray Rinse Systems	X	X	X
4C-ID Spray Rinse/Evap Makeup Sytems	X	X	X
4C-IE Oversprays/Foggers	X	X	X
4C-IF Sensor Activated Rinses	X	X	X
4C-IG Timer Flow Controls	X	X	X
4C-IH Conductivity Flow Controls	X	X	X
4C-IIA Use in Scrubbers/Cooling Towers	X	X	X
4C-IIB Reuse Process Rinsewater	X	X	X
4C-IIC Reuse of Treated Wastewater	X	X	X
4C-IIIA Mechanical Mixers	X	X	X
4C-IIIB Air Agitation	X	X	X
4C-IIIC Sonics	X	X	X
4C-IIID Tank Arrangement	X	X	X
4C-IIIE Workpiece Agitation	X	X	X

RCMs for Semiconductor Industry

4D-IA Spray Rinse	X	X	X
4D-IB Hot Ultra Pure	X	X	X
4D-IC Megasonic Rinsing	X	X	X
4D-ID Spin Rinsing	X	X	X
4D-IE Rinse Tank Geometry	X	X	X
4D-IF Idle Flow Reduction	X	X	X
4D-II Wet Benches with Built-In Recycling	X	X	X

Potential Cost Effective Flow Reduction Measures

5A-IA Sidestream Filtration	E	N	N
5A-IB Ozonation	N	N	N
5A-IC SBWR for Cooling Towers	N	N	N
5A-ID Replace with Mechanical Cooling	N	N	N
5A-IE Softening	E	A	N
5A-II Reverse Osmosis	X	X	X
5A-III High Efficiency RO	X	X	X
5A-IV Ion Exchange	X	X	X
5A-V Electrodeionization (EDI)	X	X	X

Audit Measures Matrix by Sector

Institutional	Good Samaritan Hospital	San Jose Medical Center	San Jose State University	Santa Clara County, Elmwood	Santa Clara County, Main County Jail	Santa Clara University	Santa Clara Valley Medical Center
Permit #	SJ-GOOD	SJ-SJME	SJ-SJSU	MI-ELMW	SJ-MAIN	SC-UNIV	SJ-SCVM
General Facility RCMs							
4A-IA Toilet Retofit	N	A	>5	>5	>5	E,A	>5,N
4A-IB Aerators Retrofit	N	N	A	>5	>5	E,A	A,N
4A-IC Showerhead Replacement	N	E	A	A	>5	E,A	A,N
4A-IIA Process Wastewater for Irrigation	N	N	N	N	N	N	N
4A-IIB SBWR for Irrigation	N	N	A	A	N	E	N
4A-IIIA Mechanical Seals	E		N	N	N	N	
4A-IIIB Process Wastewater for Seals	>5		N	N	N	N	A
4A-IVA Process Wastewater for Pumps	N	A	N	N	N	N	A
4A-IVB SBWR for Pumps	N	N	N	N	N	N	N
4A-VA Statistical Process Control	E	N	N	N	N	N	N
4A-VB Inspection/Maintenance	E	E	E	A	A	E	E,A
4A-VC Employee Training	E	E,A	A	A	A	E	A
HVAC and Scrubber RCMs							
4B-IA Process Wastewater for Boiler Make-up	E, A	N	N	N	N	N	N
4B-IIA Maximize Cycles of Concentration	E,A	E	A	N	A	E	>5
4B-IIB Reuse RO Reject or Process Wastewater	N	N	N	N	N	N	N
4B-IIIA Reuse Scrubber Wastewater	N	N	N	N	N	N	N
4B-IIIB Reuse Process Wastewater	N	N	N	N	N	N	N
4B-IIIC SBWR for Scrubbers	N	N	N	N	N	N	N
Process Water RCMs for Printed Circuit Board Manufacturers, Metal Finishers, and Similar Businesses							
4C-IA Flow Restrictors and Manual Flow Controls	X	X	X	X	X	X	X
4C-IB Counter Current Rinses	X	X	X	X	X	X	X
4C-IC Spray Rinse Systems	X	X	X	X	X	X	X
4C-ID Spray Rinse/Evap Makeup Sytems	X	X	X	X	X	X	X
4C-IE Oversprays/Foggers	X	X	X	X	X	X	X
4C-IF Sensor Activated Rinses	X	X	X	X	X	X	X
4C-IG Timer Flow Controls	X	X	X	X	X	X	X
4C-IH Conductivity Flow Controls	X	X	X	X	X	X	X
4C-IIA Use in Scrubbers/Cooling Towers	X	X	X	X	X	X	X
4C-IIB Reuse Process Rinsewater	X	X	X	X	X	X	X
4C-IIC Reuse of Treated Wastewater	X	X	X	X	X	X	X
4C-IIIA Mechanical Mixers	X	X	X	X	X	X	X
4C-IIIB Air Agitation	X	X	X	X	X	X	X
4C-IIIC Sonics	X	X	X	X	X	X	X
4C-IIID Tank Arrangement	X	X	X	X	X	X	X
4C-IIIE Workpiece Agitation	X	X	X	X	X	X	X
RCMs for Semiconductor Industry							
4D-IA Spray Rinse	X	X	X	X	X	X	X
4D-IB Hot Ultra Pure	X	X	X	X	X	X	X
4D-IC Megasonic Rinsing	X	X	X	X	X	X	X
4D-ID Spin Rinsing	X	X	X	X	X	X	X
4D-IE Rinse Tank Geometry	X	X	X	X	X	X	X
4D-IF Idle Flow Reduction	X	X	X	X	X	X	X
4D-II Wet Benches with Built-In Recycling	X	X	X	X	X	X	X
Potential Cost Effective Flow Reduction Measures							
5A-IA Sidestream Filtration	N		N	N	N	N	N
5A-IB Ozonation	N		N	N	N		N
5A-IC SBWR for Cooling Towers	N	N	E	N	N	N	N
5A-ID Replace with Mechanical Cooling	N		N	N	N		N
5A-IE Softening	E		N	N	N		N
5A-II Reverse Osmosis	X	X	X	X	X	X	X
5A-III High Efficiency RO	X	X	X	X	X	X	X
5A-IV Ion Exchange	X	X	X	X	X	X	X
5A-V Electrodeionization (EDI)	X	X	X	X	X	X	X

Appendix D: Comparison of Company Responses by Measure

Comparison of Company Responses by Measure — *4A-IA Toilet Retofit*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	A	59 toilets/urinals can be replaced with ULFTs, not scheduled in Worksheet 7
Hewlett Packard	SJ-003A Semiconductor	A	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	
Linear Technology	MI-006A Semiconductor	E,>5	May only be low flow toilets, not ultra low, had a greater than five year payback
Lockheed Martin Fairchild S	MI-072A Semiconductor	>5	
LSI Logic	SC-046A Semiconductor	>5	Already at 3.5 gpf
Micrel Inc.	SJ-258A Semiconductor	>5	
Seagate Technology	MI-061A Semiconductor	>5	
Unisil	SC-236A Semiconductor	E,A	Partially installed, no evaluation and not scheduled in Worksheets 6 and 7
UniSil Corp.	SC-295A Semiconductor	E	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	>5	
Dynamic Details	MI-014A PCB Manufacturer	A	
HADCO	SC-027A PCB Manufacturer	A	Already has low flow urinals, also may install sensor activated flushing (not scheduled)
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E	
IBM Corporation	SJ-007A Disk/Head Mfr	E,A	Not scheduled or evaluated in Worksheets 5-7
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	E	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	>5	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	E,A	5 existing, 11 applicable
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	E	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	A	Some mill areas need power assisted toilets due to high traffic
Doubletree Hotel	SJ-DOUB Comm: Hotel	E,>5,A	1/2 of guestroom units replaced in '99. 2nd half not scheduled & public areas not scheduled
Fairmont Hotel	SJ-FAIR Comm: Hotel	>5	606 Units
Paramount Great America	SC-PARA Comm: Theme Park	>5	Have 33 ULFTs; 231 toilets and 94 urinals are special type for which there is no ULFT
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	>5	Replace of non-inmate toilets and urinals, faucets with aerators, inmate fixtures built for abus
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	>5	Replace of non-inmate toilets and urinals, inmate fixtures built for inmate abuse
San Jose State University	SJ-SJSU Inst: Educational	>5	
Santa Clara University	SC-UNIV Inst: Educational	E,A	Ongoing
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	Have tried, did not work
San Jose Medical Center	SJ-SJME Inst: Hospital	A	As replacements needed
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	>5,N	Not in patient rooms, regulated by Title 24 - Office of State Hospital Patient Dept (OSHPD)

Number of companies assessing measure as:

(E) Existing:	14
(A) Applicable:	11
(>5) >5 Year Payback:	14
(N) Not Applicable:	2
(X) Not required for this Sector:	0

Toilet Retrofits were existing or applicable in most facilities (61%). Paramount Great America, a theme park, the Santa Clara County Elmwood and Main jails, and the mill areas at Jefferson Smurfit needed high power toilets in some areas due to high traffic or vandalism potential. Santa Clara Valley Medical stated that ultra low flow toilets were not applicable due to special needs because of patients. Due to poor experiences with low flow fixtures, Good Samaritan Hospital refused to install any low flow urinal/toilets. The Office of State Hospital Patient Development said that ultra low flow toilets were acceptable for patient facilities. Several companies also said retrofitting had a greater than five year payback for some or all toilets (39%). Some of the cost data for these companies were questionable. The City has incentive programs to make toilets and urinals more affordable. The City plans to meet with companies individually to encourage toilet and urinal retrofits.

Comparison of Company Responses by Measure — *4A-IB Aerators Retrofit*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisio	SC-060A Semiconductor	A	30 can be retrofitted, not scheduled in Worksheet 7
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild Sy	MI-072A Semiconductor	E	
LSI Logic	SC-046A Semiconductor	E	
Micrel Inc.	SJ-258A Semiconductor	>5	
Seagate Technology	MI-061A Semiconductor	E	
Unisil	SC-236A Semiconductor		
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	A	
HADCO	SC-027A PCB Manufacturer	E	Considering installing sensor activated faucets
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E	
IBM Corporation	SJ-007A Disk/Head Mfr	E	
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	E	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	E,A	one existing 12 applicable
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	E	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	A	Shift mechanics retrofitting
Doubletree Hotel	SJ-DOUB Comm: Hotel	E	Faucets have aerators
Fairmont Hotel	SJ-FAIR Comm: Hotel	E	576 guest faucet aerators installed
Paramount Great America	SC-PARA Comm: Theme Park	A	112 Units, not scheduled to be determined
Santa Clara County, Elmwoo	MI-ELMW Inst: Correctional	>5	Replace of non-inmate aerators, inmate fixtures built for inmate abuse
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	>5	Replace of non-inmate aerators, inmate fixtures built for inmate abuse
San Jose State University	SJ-SJSU Inst: Educational	A	Not scheduled or evaluated in Worksheets 5-7
Santa Clara University	SC-UNIV Inst: Educational	E,A	Ongoing
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	Have tried, did not work
San Jose Medical Center	SJ-SJME Inst: Hospital	N	Not allowed in hospitals
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	A,N	Not in patient fixtures, regulated by Title 24 by the OSHPD, not evaluated or scheduled

Number of companies assessing measure as:

(E) Existing:	19
(A) Applicable:	9
(>5) >5 Year Payback:	3
(N) Not Applicable:	3
(X) Not required for this Sector:	0

Aerator retrofits were existing or applicable for most facilities (79%). The Santa Clara County Elmwood and Main jails stated that inmate fixtures couldn't be replaced due to possible vandalism. The cost data given by the jails and Micrel Inc. to replace aerators in non-inmate faucets were questionable, especially when compared to the rest of the facilities. Due to poor experiences with low flow fixtures, Good Samaritan Hospital refused to install aerators. The Office of State Hospital Patient Development said that they did not allow aerators for patient sinks, but one hospital used waterless soap as an alternative. Hadco was also considering installing sensor-activated faucets.

Comparison of Company Responses by Measure *4A-IC Showerhead Replacement*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisio	SC-060A Semiconductor	E	
Hewlett Packard	SJ-003A Semiconductor	A	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild Sy	MI-072A Semiconductor	A	Replace 2 units, not scheduled
LSI Logic	SC-046A Semiconductor	E	
Micrel Inc.	SJ-258A Semiconductor	>5	
Seagate Technology	MI-061A Semiconductor	N	No showers
Unisil	SC-236A Semiconductor	E	
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Not scheduled, may be part of aerators retrofit
Dynamic Details	MI-014A PCB Manufacturer	N	Have only emergency showers
HADCO	SC-027A PCB Manufacturer	A	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E	
IBM Corporation	SJ-007A Disk/Head Mfr	E	
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	No showers at site
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	No showers.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	A	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	A	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	A	Shift mechanics retrofitting
Doubletree Hotel	SJ-DOUB Comm: Hotel	E	
Fairmont Hotel	SJ-FAIR Comm: Hotel	E	547 guest and employee locker room low flow shower heads installed
Paramount Great America	SC-PARA Comm: Theme Park	E	
Santa Clara County, Elmwoo	MI-ELMW Inst: Correctional	A	Replace of non-inmate showerheads, inmate fixtures built for inmate abuse, schedule TBD
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	>5	Replace of non-inmate showerhead, inmate fixtures built for inmate abuse
San Jose State University	SJ-SJSU Inst: Educational	A	Not scheduled, to be determined
Santa Clara University	SC-UNIV Inst: Educational	E,A	Ongoing
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	Have tried, did not work
San Jose Medical Center	SJ-SJME Inst: Hospital	E	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	A,N	Not in patient fixtures, regulated by Title 24 by the OSHPD, not evaluated or scheduled

Number of companies assessing measure as:

(E) Existing:	15
(A) Applicable:	11
(>5) >5 Year Payback:	2
(N) Not Applicable:	6
(X) Not required for this Sector:	0

Showerhead replacements were existing or applicable for most facilities (76%). Santa Clara County Elmwood and Main jails stated that inmate fixtures couldn't be replaced due to possible vandalism. The cost data given by the Main jail and Micrel Inc. to replace showerhead in non-inmate showers were questionable, especially when compared to the rest of the facilities. Due to poor experiences with low flow fixtures, Good Samaritan Hospital refused to install aerated showerheads. All other non-applicable facilities either had no showers or only had emergency showers with negligible water use. (12%)

Comparison of Company Responses by Measure 4A-IIA Process Wastewater for Irrigation

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	
Hewlett Packard	SJ-003A Semiconductor	N	Reclaim water TDS (780 PPM) does not meet TDS quality specs (less than 500 PPM) resp.
Intel Corporation D2P3	SC-249A Semiconductor	N	Process water quality inadequate
Intel Corporation, D2	SC-028A Semiconductor	N	Process water quality inadequate
Linear Technology	MI-006A Semiconductor	N	Already using SBWR water
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Using SBWR recycled water
LSI Logic	SC-046A Semiconductor	N	Would require large water storage; limited space
Micrel Inc.	SJ-258A Semiconductor	N	Poor water quality
Seagate Technology	MI-061A Semiconductor	A	
Unisil	SC-236A Semiconductor	N	To costly to replumb system, however Worksheets 5B-5G were not completed as directed
UniSil Corp.	SC-295A Semiconductor	N	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N	Process water quality inadequate
Dynamic Details	MI-014A PCB Manufacturer	N	
HADCO	SC-027A PCB Manufacturer	N	Wastewater is not compatible with water needs
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Irrigation <1000 gpd, considered negligible
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Insignificant irrigation gpd (<1000 gpd), location of WW Treatment makes it impractical
IBM Corporation	SJ-007A Disk/Head Mfr	>5	Rinse plant effluent already reused.elsewhere in other processes
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Process water effluent is of variable quality and may contain metals and other contaminants.
Read-Rite Corp.	MI-004A Disk/Head Mfr	A	No cost data or schedule for implementation
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	Stormwater Agency mandates potable water
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	No water used for irrigation
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	High conductivity
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	N	Cost of treatment is too expensive. Use SBWR water instead.
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	No process water
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	No process water
Paramount Great America	SC-PARA Comm: Theme Park	E	Process water from rides
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No process water suitable for reuse
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	No process water suitable for reuse
San Jose State University	SJ-SJSU Inst: Educational	N	Not suitable process water
Santa Clara University	SC-UNIV Inst: Educational	N	No process water
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	No process water
San Jose Medical Center	SJ-SJME Inst: Hospital	N	No process water
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	No process water

Number of companies assessing measure as:

(E) Existing:	1
(A) Applicable:	2
(>5) >5 Year Payback:	1
(N) Not Applicable:	29
(X) Not required for this Sector:	0

Process Water Irrigation was applicable or existing for few facilities (only 9%). Twelve facilities (36%) did not have process water or significant irrigation water use. Three of the companies were already using or planning to use South Bay Recycled Water (9%). For the rest of the facilities who had process water, the main reason for not using process water was poor water quality (27%). The five other facilities provided no justification, had no space, or found process water irrigation too costly (15%).

Comparison of Company Responses by Measure *4A-IIB SBWR for Irrigation*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	If they could get connected, SBWR currently not available
Hewlett Packard	SJ-003A Semiconductor	N	SBWR not available
Intel Corporation D2P3	SC-249A Semiconductor	A	Working with SBWR to hookup
Intel Corporation, D2	SC-028A Semiconductor	A	Working with SBWR for hookup
Linear Technology	MI-006A Semiconductor	E	Connected 1998
Lockheed Martin Fairchild S	MI-072A Semiconductor	E	
LSI Logic	SC-046A Semiconductor	N	SBWR not available
Micrel Inc.	SJ-258A Semiconductor	N	SBWR not available
Seagate Technology	MI-061A Semiconductor	N	Using another process for irrigation, SBWR not available
Unisil	SC-236A Semiconductor	N	SBWR not available
UniSil Corp.	SC-295A Semiconductor	N	SBWR not available
Vishay - Siliconix, Inc.	SC-033A Semiconductor	>5	Working with the City of Santa Clara to bring down to cost.
Dynamic Details	MI-014A PCB Manufacturer	N	SBWR not available
HADCO	SC-027A PCB Manufacturer	N	No SBWR water at this site, but interested when available
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	SBWR not available
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	SBWR not available
IBM Corporation	SJ-007A Disk/Head Mfr	N	SBWR not available
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	SBWR not available
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	SBWR unavailable.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	SBWR unavailable
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	No water used for irrigation
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	A	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	A	City will hookup SBWR recycle water
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	SBWR not available
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	SBWR not available
Paramount Great America	SC-PARA Comm: Theme Park	E	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	A	Although not included in FAS, SBWR is working with the jails offline.
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	SBWR not available
San Jose State University	SJ-SJSU Inst: Educational	A	Although < 5 year payback (6.8), SJSU is committed to saving water and is installing anyway.
Santa Clara University	SC-UNIV Inst: Educational	E	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	SBWR not available
San Jose Medical Center	SJ-SJME Inst: Hospital	N	SBWR not available
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	SBWR not available

Number of companies assessing measure as:

(E) Existing:	4
(A) Applicable:	6
(>5) >5 Year Payback:	1
(N) Not Applicable:	22
(X) Not required for this Sector:	0

Only twelve facilities (36%) were close enough to the SBWR recycle water line to consider hooking up their irrigation systems. Of these, ten stated irrigating with SBWR recycle water was either existing or applicable. Vishay-Siliconix, Inc. stated that the cost would be greater than a five-year payback, but was working with the City of Santa Clara to alleviate costs. Exchange Linen service did not irrigate on its site.

Comparison of Company Responses by Measure — *4A-IIIA Mechanical Seals*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	E	
LSI Logic	SC-046A Semiconductor	N	No water seals
Micrel Inc.	SJ-258A Semiconductor	E	
Seagate Technology	MI-061A Semiconductor	E	
Unisil	SC-236A Semiconductor	E	
UniSil Corp.	SC-295A Semiconductor	E	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	E,A	Applicable seal replacement not scheduled or evaluated in Worksheets 5-7
Dynamic Details	MI-014A PCB Manufacturer	N	
HADCO	SC-027A PCB Manufacturer	E	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E	
IBM Corporation	SJ-007A Disk/Head Mfr	E	IBM installs mechanical seals for non-abrasive water and wastewater
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Facility has no pumps requiring seal water.
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Use a closed loop liquid ring seal.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	Also has project to replace three vacuum pumps with three steam vacuum eductors
Exchange Linen Services	SJ-022C Oth Ind: Laundry	E	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	A	Project replacing pumps w/ pumpable packing applicable/ Replacing mech seals not evaluated
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	E	
Doubletree Hotel	SJ-DOUB Comm: Hotel	E	
Fairmont Hotel	SJ-FAIR Comm: Hotel	E	
Paramount Great America	SC-PARA Comm: Theme Park	N	Evaluated project proposing to close loop (>5)
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No pumps requiring seals
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	No pumps requiring seals
San Jose State University	SJ-SJSU Inst: Educational	N	Negligible water use
Santa Clara University	SC-UNIV Inst: Educational	N	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	E	
San Jose Medical Center	SJ-SJME Inst: Hospital		
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital		

Number of companies assessing measure as:

(E) Existing:	21
(A) Applicable:	2
(>5) >5 Year Payback:	0
(N) Not Applicable:	9
(X) Not required for this Sector:	0

64% of the facilities already had mechanical seals. Two facilities considered changing to mechanical seals applicable. Seven facilities did not have seals or had closed-loop seals with negligible water use. Paramount Great America evaluated closed loop, but this had a greater than five year payback. However, since this measure was not applicable, they should have evaluated the other pump seal measures. Sorrento Cheese replaced its vacuum pumps with steam vacuum eductors that had negligible water use. No justification was given for the three other companies.

Comparison of Company Responses by Measure 4A-IIIB Process Wastewater for Seals

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Don't have equipment to treat acid waste contaminated water for reuse.
Hewlett Packard	SJ-003A Semiconductor	N	Closed loop
Intel Corporation D2P3	SC-249A Semiconductor	N	Process water quality inadequate
Intel Corporation, D2	SC-028A Semiconductor	N	Process water quality inadequate
Linear Technology	MI-006A Semiconductor	N	No seal water
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Only mechanical seals used on facility pumps
LSI Logic	SC-046A Semiconductor	N	No water seals
Micrel Inc.	SJ-258A Semiconductor	N	
Seagate Technology	MI-061A Semiconductor	N	
Unisil	SC-236A Semiconductor	N	
UniSil Corp.	SC-295A Semiconductor	N	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	>5	Project to close loop pump seals
Dynamic Details	MI-014A PCB Manufacturer	N	Would affect life of pumps
HADCO	SC-027A PCB Manufacturer	N	Not close enough together
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Uses mechanical seals
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Pumps use mechanical seals
IBM Corporation	SJ-007A Disk/Head Mfr	A	Reuse treated wastewater in pumps in the concentrate wastewater treatment plant
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Facility has no pumps requiring seal water.
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Use a closed loop liquid ring seal.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	All seals mechanical
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	To high in solids and temperature
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	E	
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	No process water
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	Pumps have mechancial seals
Paramount Great America	SC-PARA Comm: Theme Park	>5	Evaluated project proposing to close loop
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No pumps requiring seals
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	No pumps requiring seals
San Jose State University	SJ-SJSU Inst: Educational	N	Negligible water use
Santa Clara University	SC-UNIV Inst: Educational	N	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	>5	Deemed not cost effective, but no cost analysis was done in Worksheets 5B-5G
San Jose Medical Center	SJ-SJME Inst: Hospital		
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	A	Will evaluate using treated process water for seals where appropriate

Number of companies assessing measure as:

(E) Existing:	1
(A) Applicable:	2
(>5) >5 Year Payback:	3
(N) Not Applicable:	26
(X) Not required for this Sector:	0

Only three facilities (9%) considered using process wastewater for seals applicable or existing. However, 48% of the facilities did not have seals, had negligible water use, were closed loop or had no process water. The main reason for most of the remaining facilities who provided justification (18%) not to use process for seals was concern over water quality. The United States Diary Association (USDA) milk-processing regulations prohibited Sorrento Cheese for using process water for seals. Two facilities evaluated closed loop systems, but the payback was greater than five years. The rest of the facilities (23%) either had no space for a tank and plumbing, stated that changing seal water was not cost effective (although they did not submit a cost evaluation or provided no justification for stating “not applicable” or left the measure blank).

Comparison of Company Responses by Measure 4A-IVA Process Wastewater for Pumps

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Don't have equipment to treat acid waste contaminated water for reuse.
Hewlett Packard	SJ-003A Semiconductor	N	Reclaim exceeds TDS, hardness, or chloride water quality specs (<200,200,10 PPM) resp.
Intel Corporation D2P3	SC-249A Semiconductor	N	Process water quality inadequate
Intel Corporation, D2	SC-028A Semiconductor	N	Process water quality inadequate
Linear Technology	MI-006A Semiconductor	E	Pumps are on process water system via CT system
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Only mechanical seals used on facility pumps
LSI Logic	SC-046A Semiconductor	N	No water seals
Micrel Inc.	SJ-258A Semiconductor	N	
Seagate Technology	MI-061A Semiconductor	N	
Unisil	SC-236A Semiconductor	E	
UniSil Corp.	SC-295A Semiconductor	A	Not evaluated or scheduled
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Per Comments, no pumps of this type, but there is project to close loop liquid ring vacuum p
Dynamic Details	MI-014A PCB Manufacturer	N	None existing
HADCO	SC-027A PCB Manufacturer	E	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	
IBM Corporation	SJ-007A Disk/Head Mfr	E,A	Existing at one of two pumps, recycle pump water project not scheduled or evaluated
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Facility has no liquid ring vacuum pumps.
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Use a closed loop liquid ring seal. Little make-up water required.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	Negligible flow use (125 gpd)
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	E	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	E	
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	No process water
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	Pumps have mechancial seals
Paramount Great America	SC-PARA Comm: Theme Park	N	Evaluated project proposing to close loop (>5)
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No pumps requiring seals
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	No pumps requiring seals
San Jose State University	SJ-SJSU Inst: Educational	N	Negligible water use
Santa Clara University	SC-UNIV Inst: Educational	N	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	Air cooled only
San Jose Medical Center	SJ-SJME Inst: Hospital	A	Project to recycle water for vacuum pumps
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	A	Project to close loop pump seals

Number of companies assessing measure as:

(E) Existing:	6
(A) Applicable:	5
(>5) >5 Year Payback:	0
(N) Not Applicable:	23
(X) Not required for this Sector:	0

Reusing process wastewater for vacuum ring pumps was existing or applicable in ten facilities (30%). Two of the applicable projects evaluated closed loop vacuum pumps. Twelve facilities did not have these types of pumps, only used mechanical or air cooled pumps, were closed loop already or did not have process water. The United States Diary Association (USDA) milk-processing regulations prohibited Sorrento Cheese for using process water for seals. Four other facilities would not reuse process water due to concerns over water quality; especially high total dissolved solids. The rest provided no justification for stating “not applicable” or left the measure blank.

Comparison of Company Responses by Measure — *4A-IVB SBWR for Pumps*

Company Name	Permit # / Comp Type		Assessment of Measure and Comments
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	No SBWR water at this site.
Hewlett Packard	SJ-003A Semiconductor	N	SBWR not available
Intel Corporation D2P3	SC-249A Semiconductor	N	SBWR recycled water quality inadequate
Intel Corporation, D2	SC-028A Semiconductor	N	SBWR recycled water quality inadequate
Linear Technology	MI-006A Semiconductor	N	Already using process water
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Only mechanical seals used on facility pumps
LSI Logic	SC-046A Semiconductor	N	SBWR not available, no water seals
Micrel Inc.	SJ-258A Semiconductor	N	
Seagate Technology	MI-061A Semiconductor	N	SBWR not available
Unisil	SC-236A Semiconductor	N	SBWR not available
UniSil Corp.	SC-295A Semiconductor	N	SBWR not available
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N	Per Comments, no pumps of this type, but there's a project to close loop liquid ring vacuum p
Dynamic Details	MI-014A PCB Manufacturer	N	SBWR not available
HADCO	SC-027A PCB Manufacturer	N	No SBWR water at this site, but interested when available
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	
IBM Corporation	SJ-007A Disk/Head Mfr	N	SBWR not available
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Facility has no liquid ring vacuum pumps.
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	SBWR unavailable.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	Negligible flow use (125 gpd)
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	Already use process water
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	N	SBWR water would mix with process water which is undesirable.
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	SBWR not available
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	Pumps have mechancial seals, SBWR not available
Paramount Great America	SC-PARA Comm: Theme Park	N	Evaluated project proposing to close loop (>5)
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No pumps requiring seals
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	No pumps requiring seals
San Jose State University	SJ-SJSU Inst: Educational	N	Negligible water use
Santa Clara University	SC-UNIV Inst: Educational	N	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	SBWR not available
San Jose Medical Center	SJ-SJME Inst: Hospital	N	SBWR not available
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	SBWR not available

Number of companies assessing measure as:

(E) Existing:	0
(A) Applicable:	0
(>5) >5 Year Payback:	0
(N) Not Applicable:	33
(X) Not required for this Sector:	0

No facilities considered using SBWR recycled water for pumps, although the main reason was that SBWR water was not available (42%). Also, others facilities did not have seals, used mechanical seals, were closed loop, or used negligible water in pumps (27%). Two facilities were already reusing process wastewater for this use. The United States Diary Association (USDA) milk-processing regulations prohibited Sorrento Cheese for using SBWR recycled water for seals. Jefferson Smurfit did not want to mix process water with SBWR recycled water. Two facilities would not use SBWR recycled water in pump seals due to concern over water quality. The rest provided no justification for stating “not applicable” (18%).

Comparison of Company Responses by Measure 4A-VA Statistical Process Control

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Production fluctuations make it difficult to employ SPC
LSI Logic	SC-046A Semiconductor	E	
Micrel Inc.	SJ-258A Semiconductor	N	
Seagate Technology	MI-061A Semiconductor	E	
Unisil	SC-236A Semiconductor	E	
UniSil Corp.	SC-295A Semiconductor	E	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	E,A	Will be evaluated for DI/CT/AWN, schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	E	
HADCO	SC-027A PCB Manufacturer	E	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E	
IBM Corporation	SJ-007A Disk/Head Mfr	E	
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Process operations vary with business conditions, research & development.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	E	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	A	Project not evaluated or scheduled
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	E	
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	
Paramount Great America	SC-PARA Comm: Theme Park	N	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No processes
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	Not a process operation
San Jose State University	SJ-SJSU Inst: Educational	N	No process water
Santa Clara University	SC-UNIV Inst: Educational	N	No process water
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	E	
San Jose Medical Center	SJ-SJME Inst: Hospital	N	Hospital not manufacturing
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	No process water

Number of companies assessing measure as:

(E) Existing:	20
(A) Applicable:	2
(>5) >5 Year Payback:	0
(N) Not Applicable:	12
(X) Not required for this Sector:	0

63% of the facilities considered statistical process control existing or applicable. Two facilities also stated that their processes fluctuated too much to employ statistical process control. Most of the facilities that did not consider this measure did not have process water.

Comparison of Company Responses by Measure ***4A-VB Inspection/Maintenance***

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	E	
LSI Logic	SC-046A Semiconductor	E	
Micrel Inc.	SJ-258A Semiconductor	A	Minimizing Fab water waste, leaks etc,
Seagate Technology	MI-061A Semiconductor	E	
Unisil	SC-236A Semiconductor	E	
UniSil Corp.	SC-295A Semiconductor	E	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	E,A	PM rounds ensure consistent operation, schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	E	
HADCO	SC-027A PCB Manufacturer	E	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E	
IBM Corporation	SJ-007A Disk/Head Mfr	E	
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	E	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	E	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	E,A	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	E	
Doubletree Hotel	SJ-DOUB Comm: Hotel	E	
Fairmont Hotel	SJ-FAIR Comm: Hotel	E	
Paramount Great America	SC-PARA Comm: Theme Park	E	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	A	Not summarized or scheduled
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	A	
San Jose State University	SJ-SJSU Inst: Educational	E	
Santa Clara University	SC-UNIV Inst: Educational	E	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	E	
San Jose Medical Center	SJ-SJME Inst: Hospital	E	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	E,A	Not evaluated or scheduled

Number of companies assessing measure as:

(E) Existing:	30
(A) Applicable:	6
(>5) >5 Year Payback:	0
(N) Not Applicable:	0
(X) Not required for this Sector:	0

All facilities considered inspection/maintenance existing or applicable.

Comparison of Company Responses by Measure — *4A-VC Employee Training*

Company Name	Permit # / Comp Type		Assessment of Measure and Comments
Analog Devices, PMI Divisi	SC-060A Semiconductor	A	Not scheduled in Worksheet 7
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	A	Not scheduled
LSI Logic	SC-046A Semiconductor	E	
Micrel Inc.	SJ-258A Semiconductor	E	
Seagate Technology	MI-061A Semiconductor	E	
Unisil	SC-236A Semiconductor	E	
UniSil Corp.	SC-295A Semiconductor	E	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	E,A	Standard operator traiing, schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	E	
HADCO	SC-027A PCB Manufacturer	A	1765 employees attended water conservation training 2/99 & separate sessions for engineers
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E	
IBM Corporation	SJ-007A Disk/Head Mfr	E	
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	A	No cost data or schedule for implementation
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	E	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	E	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	E	
Doubletree Hotel	SJ-DOUB Comm: Hotel	E	
Fairmont Hotel	SJ-FAIR Comm: Hotel	E	
Paramount Great America	SC-PARA Comm: Theme Park	E	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	A	Not summarized or scheduled
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	A	
San Jose State University	SJ-SJSU Inst: Educational	A	
Santa Clara University	SC-UNIV Inst: Educational	E	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	E	
San Jose Medical Center	SJ-SJME Inst: Hospital	E,A	Project called Waterwise Employee Training
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	A	Not evaluated or scheduled

Number of companies assessing measure as:

(E) Existing:	25
(A) Applicable:	10
(>5) >5 Year Payback:	0
(N) Not Applicable:	0
(X) Not required for this Sector:	0

All facilities considered employee training applicable or existing.

Comparison of Company Responses by Measure 4B-IA Process Wastewater for Boiler Make-up

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Not feasible at the present.
Hewlett Packard	SJ-003A Semiconductor	N	Closed loop system
Intel Corporation D2P3	SC-249A Semiconductor	N	Process water quality inadequate
Intel Corporation, D2	SC-028A Semiconductor	N	Process water quality inadequate
Linear Technology	MI-006A Semiconductor	N	Would require approval of Insurance Co, Water Treatment Co, and State Industrial Board
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	High TDS
LSI Logic	SC-046A Semiconductor	N	Would require extensive treatment; little savings
Micrel Inc.	SJ-258A Semiconductor	N	No boiler
Seagate Technology	MI-061A Semiconductor	N	No boilers
Unisil	SC-236A Semiconductor	N	No boilers
UniSil Corp.	SC-295A Semiconductor	N	No boilers
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N	No boilers
Dynamic Details	MI-014A PCB Manufacturer	N	No boiler
HADCO	SC-027A PCB Manufacturer	N	Process water too hard
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	No boilers
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	No boilers
IBM Corporation	SJ-007A Disk/Head Mfr	N	Wafer Fab rinse plant effluent is used to capacity in cooling towers.
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Steam boiler used to humidify clean rooms, and therefore, could contaminate these rooms
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Closed loop system. Make-up water, when needed, is from the chilled water loop.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	Culinary steam, USDA milk processing regulations prohibit, App D of Pasteurized Milk Ordinan
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	Detergent Residue high
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No boilers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	N	Process water would cost too much to treat for makeup.
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	No process water
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	No process water
Paramount Great America	SC-PARA Comm: Theme Park	N	No boiler
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No boilers
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	Closed loop boiler, no process water suitable for reuse
San Jose State University	SJ-SJSU Inst: Educational	N	Closed loop boiler
Santa Clara University	SC-UNIV Inst: Educational	N	No process water for makeup
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	E, A	Can use condenser water, not scheduled or evaluated in Worksheets 5-7
San Jose Medical Center	SJ-SJME Inst: Hospital	N	No process water
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	No boilers

Number of companies assessing measure as:

(E) Existing:	1
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	32
(X) Not required for this Sector:	0

Only one facility considered reusing process water, condenser water, as boiler makeup as existing/applicable. 36% did not have boilers, 12% did not have process water, and 12% have closed-loop boilers. 27% of the facilities did not consider process wastewater as boiler makeup due to water quality concerns. Hewlett Packard said that the measure required approval from their insurance company due to compensation for breakdown issues. Analog Devices stated reusing process water in boilers was not feasible at present, but provided no justifications or schedules as to why or when this measure would be feasible.

Comparison of Company Responses by Measure 4B-IIA Maximize Cycles of Concentration

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Cannot use greater than 5. Need this for blowdown reuse. Using 4 COCs now.
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	N	Focused on reusing RO reject
Intel Corporation, D2	SC-028A Semiconductor	N	Focusing on recycling RO reject into cooling towers
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	E	Exceeds 6 cycles, using process WW
LSI Logic	SC-046A Semiconductor	E	
Micrel Inc.	SJ-258A Semiconductor	A	
Seagate Technology	MI-061A Semiconductor	E	
Unisil	SC-236A Semiconductor	N	No cooling towers
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	E,A	Using from 5 to 8 cycles of concentration
Dynamic Details	MI-014A PCB Manufacturer	E	Closed loop
HADCO	SC-027A PCB Manufacturer	N	No cooling towers
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E	Closed loop cooling, <20 gallons of week used so negligible
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E	Closed loop chiller uses < 20 gallons per week
IBM Corporation	SJ-007A Disk/Head Mfr	E	
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	A	No cost data or schedule for implementation
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	No cooling towers
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No cooling towers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	E	Running at 7.5 cycles, blow down not used for other processes
Doubletree Hotel	SJ-DOUB Comm: Hotel	>5	
Fairmont Hotel	SJ-FAIR Comm: Hotel	A	Not evaluated or scheduled in Worksheets 5 - 7
Paramount Great America	SC-PARA Comm: Theme Park	N	No cooling tower
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No cooling towers
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	A	Schedule to be determined
San Jose State University	SJ-SJSU Inst: Educational	A	Currently studying effects of raising the cycles of concentration when using recycled water
Santa Clara University	SC-UNIV Inst: Educational	E	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	E,A	Will be also replacing cooling tower with more water effiencient model.
San Jose Medical Center	SJ-SJME Inst: Hospital	E	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	>5	

Number of companies assessing measure as:

(E) Existing:	16
(A) Applicable:	7
(>5) >5 Year Payback:	2
(N) Not Applicable:	9
(X) Not required for this Sector:	0

64% found this measure to be existing and/or applicable. Three of these facilities were closed loop. Two facilities evaluated the cost to be greater than five-year payback. Six facilities did not have cooling towers. Intel's two facilities decided not to focus on maximizing cooling towers in order to reuse RO reject. Analog Devices also did not want to increase cycles of concentration since cooling tower blowdown was used for other uses.

Comparison of Company Responses by Measure 4B-IIB Reuse RO Reject or Process Wastewater

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Use RO reject in the scrubbers.
Hewlett Packard	SJ-003A Semiconductor	N	Reclaim (TDS=780, Hardness=429, Conductivity 1010) exceeds quality specifications(400, 1
Intel Corporation D2P3	SC-249A Semiconductor	A	RO reject in cooling towers
Intel Corporation, D2	SC-028A Semiconductor	A	Recycle RO reject
Linear Technology	MI-006A Semiconductor	E	Approximately 2/3 fed by process water
Lockheed Martin Fairchild S	MI-072A Semiconductor	E	RO reject through AWNS
LSI Logic	SC-046A Semiconductor	>5	But scheduled
Micrel Inc.	SJ-258A Semiconductor	N	Poor water quality due to use of two stage RO
Seagate Technology	MI-061A Semiconductor	A	
Unisil	SC-236A Semiconductor	N	No cooling towers
UniSil Corp.	SC-295A Semiconductor	A	3 cooling towers
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	N	Towers are closed loop
HADCO	SC-027A PCB Manufacturer	N	No cooling towers
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Closed loop chiller uses < 20 gallons per week
IBM Corporation	SJ-007A Disk/Head Mfr	E	
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	1st. stage RO sent to 2nd. Stage.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	Organic loading prohibits reusing process water
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	No cooling towers
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No cooling towers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	N	RO put back into fresh water inlet and used in higher std. situations than cooling tower water
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	No process water or RO
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	No process water
Paramount Great America	SC-PARA Comm: Theme Park	N	No cooling tower
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No process water
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	No process water suitable for reuse
San Jose State University	SJ-SJSU Inst: Educational	N	Using SBWR recycled water
Santa Clara University	SC-UNIV Inst: Educational	N	No process water nor RO reject for makeup
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	No process water
San Jose Medical Center	SJ-SJME Inst: Hospital	N	No process water
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	No RO or process water

Number of companies assessing measure as:

(E) Existing:	4
(A) Applicable:	5
(>5) >5 Year Payback:	1
(N) Not Applicable:	23
(X) Not required for this Sector:	0

27% of the facilities considered reusing RO reject or process wastewater for cooling tower makeup existing or applicable. LSI Logic found this measure to have a greater than five year payback, but would still implement it. Six facilities did not have cooling towers and eight facilities did not have process water. Four facilities stated water quality concerns as the major reason for not recycling process water into cooling towers. One of these facilities, Read-Rite Corporation, stated that its RO reject could not be used since it had second-pass reject water quality, but there was no mention of recycling other process wastewaters. Analog Devices already used RO reject in scrubbers, but also did not mention recycling other process wastewater as cooling tower makeup. San Jose State University uses SBWR recycled water as makeup in their cooling tower.

Comparison of Company Responses by Measure *4B-IIIA Reuse Scrubber Wastewater*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisio	SC-060A Semiconductor	N	We cannot. This goes to the AWN.
Hewlett Packard	SJ-003A Semiconductor	N	High organic and TDS levels
Intel Corporation D2P3	SC-249A Semiconductor	N	Scrubber discharge water quality inadequate
Intel Corporation, D2	SC-028A Semiconductor	N	Scrubber discharge water quality inadequate
Linear Technology	MI-006A Semiconductor	N	Already using 2/3 process water
Lockheed Martin Fairchild Sy	MI-072A Semiconductor	E	through AWN reclaim
LSI Logic	SC-046A Semiconductor	N	Water would require extensive treatment
Micrel Inc.	SJ-258A Semiconductor	N	
Seagate Technology	MI-061A Semiconductor	N	No scrubbers
Unisil	SC-236A Semiconductor	N	Already reusing RO reject
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	N	Very small unit, to many contaminents
HADCO	SC-027A PCB Manufacturer	E	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Flow is negligible
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Negligible water use
IBM Corporation	SJ-007A Disk/Head Mfr	N	No reuse opportunities for scrubber wastewater.
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	No scrubbers
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	No scrubbers.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	No scrubbers
Exchange Linen Services	SJ-022C Oth Ind: Laundry	E	Water for lint traps currently recycled
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No scrubbers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	N	No scrubbers.
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	No scrubbers
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	No scrubbers
Paramount Great America	SC-PARA Comm: Theme Park	N	No scrubbers
Santa Clara County, Elmwoo	MI-ELMW Inst: Correctional	N	No scrubber
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	No scrubbers
San Jose State University	SJ-SJSU Inst: Educational	N	No scrubbers
Santa Clara University	SC-UNIV Inst: Educational	N	No scrubbers
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	No scrubber
San Jose Medical Center	SJ-SJME Inst: Hospital	N	No scrubbers
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	No scrubbers

Number of companies assessing measure as:

(E) Existing:	3
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	28
(X) Not required for this Sector:	0

Only four facilities found reusing scrubber wastewater existing or applicable. However, 60% of the facilities did not have scrubbers, their scrubber water use was negligible, or were already reusing process water or RO in scrubbers. Of the remaining facilities, seven stated poor water quality as the main reason for not reusing scrubber wastewater. The rest provided no justification for stating “not applicable”.

Comparison of Company Responses by Measure ***4B-IIIB Reuse Process Wastewater***

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	A	Probably in the future.
Hewlett Packard	SJ-003A Semiconductor	E,A	Project to reuse pump seal water into scrubbers
Intel Corporation D2P3	SC-249A Semiconductor	N	Process water quality inadequate
Intel Corporation, D2	SC-028A Semiconductor	N	Process water quality inadequate
Linear Technology	MI-006A Semiconductor	E	Approximately 2/3 fed by process water
Lockheed Martin Fairchild S	MI-072A Semiconductor	E	
LSI Logic	SC-046A Semiconductor	>5	But scheduled
Micrel Inc.	SJ-258A Semiconductor	>5	
Seagate Technology	MI-061A Semiconductor	N	No scrubbers
Unisil	SC-236A Semiconductor	E	Uses RO reject
UniSil Corp.	SC-295A Semiconductor	A	3 scrubbers and 1 NOX scrubber
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	E	Using membrane water instead, too many contaminents in process water
HADCO	SC-027A PCB Manufacturer	N	Process water too hard
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Flow is negligible
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Negligible water use
IBM Corporation	SJ-007A Disk/Head Mfr	E	
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	No scrubbers
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	No scrubbers.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	No scrubbers
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	Already reusing scrubber wastewater
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No scrubbers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	N	No scrubbers.
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	No scrubbers
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	No scrubbers
Paramount Great America	SC-PARA Comm: Theme Park	N	No scrubbers
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No scrubber
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	No scrubbers
San Jose State University	SJ-SJSU Inst: Educational	N	No scrubbers
Santa Clara University	SC-UNIV Inst: Educational	N	No scrubbers
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	No scrubber
San Jose Medical Center	SJ-SJME Inst: Hospital	N	No scrubbers
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	No scrubbers

Number of companies assessing measure as:

(E) Existing:	6
(A) Applicable:	4
(>5) >5 Year Payback:	2
(N) Not Applicable:	22
(X) Not required for this Sector:	0

24% considered reusing process wastewater in scrubbers existing or applicable. However, 58% of the facilities did not have scrubbers, their scrubber water use was negligible, or were already reusing scrubber wastewater. Micrel and LSI Logic found that the measure had a payback greater than five years, but LSI Logic scheduled this project anyway. Three facilities found the process water quality inadequate mainly due to hardness. The rest provided no justification for stating “not applicable”.

Comparison of Company Responses by Measure *4B-IIIC SBWR for Scrubbers*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Would use as make-up water, but no SBWR at this site.
Hewlett Packard	SJ-003A Semiconductor	N	SBWR not available
Intel Corporation D2P3	SC-249A Semiconductor	N	SBWR recycled water quality inadequate
Intel Corporation, D2	SC-028A Semiconductor	N	SBWR recycled water quality inadequate
Linear Technology	MI-006A Semiconductor	N	Already using 2/3 process water
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Using process water
LSI Logic	SC-046A Semiconductor	N	SBWR not available
Micrel Inc.	SJ-258A Semiconductor	N	SBWR not available
Seagate Technology	MI-061A Semiconductor	N	No scrubbers, SBWR not available
Unisil	SC-236A Semiconductor	N	SBWR not available
UniSil Corp.	SC-295A Semiconductor	N	SBWR not available
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Needs pipeline extension to facility
Dynamic Details	MI-014A PCB Manufacturer	N	SBWR not available
HADCO	SC-027A PCB Manufacturer	N	No SBWR water at this site, but interested when available
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	SBWR not available
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	SBWR not available
IBM Corporation	SJ-007A Disk/Head Mfr	N	SBWR not available
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	No scrubbers
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Outside SBWR service area.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	No scrubbers
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	Already reusing scrubber wastewater
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No scrubbers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	N	No scrubbers.
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	No scrubbers
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	No scrubbers, SBWR not available
Paramount Great America	SC-PARA Comm: Theme Park	N	No scrubbers
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No scrubber
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	No scrubbers
San Jose State University	SJ-SJSU Inst: Educational	N	No scrubbers
Santa Clara University	SC-UNIV Inst: Educational	N	No scrubbers
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	No scrubber
San Jose Medical Center	SJ-SJME Inst: Hospital	N	No scrubbers
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	No scrubbers

Number of companies assessing measure as:

(E) Existing:	0
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	32
(X) Not required for this Sector:	0

Only Vishay-Siliconix considered SBWR water applicable. However, 82% either did not have scrubbers, their scrubbers water use was negligible, or were withing the vicinity of the SBWR pipeline. Three facilities already used process water or recycled scrubber water. Two facilities found SBWR recycled water quality inadequate.

Comparison of Company Responses by Measure 4C-IA Flow Restrictors / Manual Flow Controls

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	Wafer Fab
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	E	In Tape Automated Bumping (TAB)/C4 Operations
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	E,N	Not in Fab 3, 5, closed loop, pressure washer used
HADCO	SC-027A PCB Manufacturer	E,A	Applicable in B-2, DES lines 3,4,&5, C-1
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E	
IBM Corporation	SJ-007A Disk/Head Mfr	E	In Wafer, Fab, Disk, and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M1and M3; M2 uses sensor activated controls, M4 uses automated controls
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	8
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	2
(X) Not required for this Sector:	25

Measure was directed toward the printed circuit board manufacturers (PCB manufacturers). Four printed circuit boards, two disk/head manufacturers (HD) and two semiconductor manufacturers (SC) completed Worksheets 4C.

Of the semiconductor manufacturers, flow restrictors and manual controls are used in both Analog Devices' Wafer Fab and Intel Corporation D2's Tape Automated Bumping (TAB) C4 Operations. Use of flow restrictors differed between the two head disk manufacturers. IBM used them in all of its processes. Komag used mostly automated controls. PCB Manufacturers used flow restrictors and manual controls for most of their lines. Dynamic Details already used restrictors and manual controls in all of its lines. Hadco had a project to add flow restrictors to the remaining DES lines and Electroless Cu Line. Samina I and II already used flow restrictors were already used in all its process lines.

Comparison of Company Responses by Measure ***4C-IB Counter Current Rinses***

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Wafer Fab wrong type of system. No space.
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	N	TAB/C4 Operations have spray rinses only
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	A	For final clean and Oliver wash, in R&Dt, will notify ESD when implemented
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	E,N	Not in Fab 3, 4-2,4-3, 5,6,7-1,7-7 closed loop, conveyor process
HADCO	SC-027A PCB Manufacturer	E,N	Not in ID# C-5 no rinse sump so no counter current rinse
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E	
IBM Corporation	SJ-007A Disk/Head Mfr	N,E	Not suited for Wafer, Fab, and Assembly, existing in Disks
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M1, M2 and M3, M4 has no rinse steps
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	6
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	6
(X) Not required for this Sector:	24

Seagate considered counter-current rinses along with the other two semiconductor manufacuters. Analog Devices and Intel D2's process lines used spray rinses therefore counter current rinsing was not applicable. Seagate had a project under development to apply counter current rinsing in it final clean and Oliver wash. Both head disk manufacturers used counter current rinsing. IBM used counter current rinsing in Fab and Disks processes, not in Wafer and Assembly Processes. Komag used counter current rinsing in Cleaning, Polishing, and Texturing. PCB Manufacturers did use counter-current rinsing in most processes except for special case processes. Dynamic Details did not use counter-current rinsing in Dry Clean Pre Clean (conveyor process); Tin Lead Soldering (one rinse), and Full Body Gold (may become contaminated). Hadco did not use counter current in dry film processes since there is no rinse sump. Samina I and II already used counter current rinses in all its processes.

Comparison of Company Responses by Measure — *4C-IC Spray Rinse Systems*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	Wafer Fab
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	E	In TAB/C4 Operations
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	E,N	Not in Fab 1,3,7-1,7-3,7-4,7-6, 7-7 rinse quality.closed loop
HADCO	SC-027A PCB Manufacturer	E,N	Not in ID# B-1, C-1, C-2, C-3, C-4 not compatible to existing systems and product quality
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N,E	Not in EP since premanufactured unmodifiable, 4C-IA and IB replace in manual CU
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N,E	Not in EP since premanufactured unmodifiable, 4C-IA and IB replace in manual CU
IBM Corporation	SJ-007A Disk/Head Mfr	E	In Wafer, Fab, Disk, and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M1, M2 and M3. M4 has no rinse steps
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	8
(A) Applicable:	0
(>5) >5 Year Payback:	0
(N) Not Applicable:	5
(X) Not required for this Sector:	25

Two semiconductor manufacturers, Analog Devices and Intel Corporation D2, already used spray rinses. Two disk manufacuturers use spray rinsing in most processes. IBM already uses spray rinsing in all its processes and Komag uses spray rinsing in all its processes except sputtering which has no rinsing. All of the PCB Manufacturers all used spray rinsing in their DES, Dry Film pre-cleaning and aluminim oxide surface treatment. Dynamic Details also used spray rinsing in Screen Cleaning, Hot Air Level and Cu Electro and Strip-Etch-Strip Plating Lines. Spray rinsing was not used in tin-lead plating, since only had one rinse and gold immersion line since it was a delicate process. Hadco also used spray rinses in its liquid photo imaging line but not in its plating processes due to inadequate rinsing impact on product quality. Samina I and II used spray rinses in their developers, scrubbers, etches, and strippers. Their prefabricated automated electroplating lines did not use spray rinses and could not be modified. None of the facilities used spray rinsing in their black oxide and cuposit lines since spray rinsing does not clean holes effectively.

Comparison of Company Responses by Measure 4C-ID Spray Rinse/Evap Makeup Sytems

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	X	Not applicable for our type of manufacturing.
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	N	TAB/C4 Operations have spray rinses only
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	E,N	Not in Fab 1,3,5,7-1,7-3,7-4,7-6,7-3 rinse quality,closed loop
HADCO	SC-027A PCB Manufacturer	E,N	Not in ID# B-1,C-1,C-2,C-3, C-6 product quality, C-4 immersion only
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Not in EP, DE premanufactured unmodifiable; redundant in SB, ET, ST; bath dilution in CU
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Not in EP, DE premanufactured unmodifiable; redundant in SB, ET, ST; bath dilution in CU
IBM Corporation	SJ-007A Disk/Head Mfr	N	Not suited for either Wafer, Fab, Disk, Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Evaporation is not significant in all processes
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	2
(A) Applicable:	0
(>5) >5 Year Payback:	0
(N) Not Applicable:	7
(X) Not required for this Sector:	26

Spray Rinse/Evaporation Makeup systems are not applicable for semiconductor manufactures and evaporation is insignificant for disk head manufacturing processes. The PCB Manufacturers varied in their uses of spray rinse/ makeup systems. Dynamic Details used evaporation makeup systems for all their spray rinses except for Screen Cleaning. This process only used spray rinse when needed. Hadco also used spray rinse/ evaporation makeup systems in its DES, Al oxide/pumice scrubbing processes, and dry film processing. Hadco also used evaporation makeup systems in all of its spray rinses except for its Liquid Photo Imaging line. Dissolved Solids in rinse made spray rinse/evaporation makeup systems unsuitable for liquid photo imaging developer and scrubbers. Samina I and II did not use spray rinse/evaporation makeup systems in any of its prefabricated automated lines that could not be modified to include this measure.

Comparison of Company Responses by Measure — *4C-IE Oversprays/Foggers*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	X	Not applicable for our type of manufacturing.
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	N	TAB/C4 Operations have spray rinses only
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	N	Poor rinse quality; conveyorized process, closed loop
HADCO	SC-027A PCB Manufacturer	N	Not used in any process since not compatible to existing systems and product quality
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Not in EP, DE premanufactured unmodifiable; redundant in SB, ET, ST; bath dilution in CU
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Not in EP, DE premanufactured unmodifiable; redundant in SB, ET, ST; bath dilution in CU
IBM Corporation	SJ-007A Disk/Head Mfr	N	Not suited for either Wafer, Fab, Disk, Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M1 and M2; Spray rinses are significant for M3 and M4 has no rinse steps
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	1
(A) Applicable:	0
(>5) >5 Year Payback:	0
(N) Not Applicable:	7
(X) Not required for this Sector:	26

Oversprays/Foggers were not applicable for semiconductor manufacturing. Head disk manufacturers differed on overspray/fogger use. IBM found this measure unsuitable for any of its processes. However, komag already used oversprays/foggers in its cleaning and polishing processes. PCB Manufacturers did not use oversprays/foggers in any of their processes due to poor rinse quality.

Comparison of Company Responses by Measure ***4C-IF Sensor Activated Rinses***

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	Wafer Fab
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	E	In TAB/C4 Operations
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	E, N,A	Appl. in Fab 7-2, Exist in Fab 2, 4-1, 7-5, 7-7, NA already optimized, rinse quality; too delicate
HADCO	SC-027A PCB Manufacturer	E,N	Not in C-1, need constant overflow, C-4 cascade rinse no turnover
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N,E	In ET, ST, DE, SB; Not in EP, premanufactured unmodifiable; No need in manual CU
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N,E	In ET, ST, DE, SB; Not in EP, premanufactured unmodifiable; No need in manual CU
IBM Corporation	SJ-007A Disk/Head Mfr	E,N	In Wafer, Disks, Timer flow controls are used in Fab and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M1 and M2, M3 uses timers and M4 has no rinse steps
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	8
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	6
(X) Not required for this Sector:	25

Both semiconductor manufacturers Analog Devices and Intel D2 used sensor-activated rinses in wafer and TAB/C4 Operations, respectively. IBM used sensor-activated rinses in its Wafer and Disk processes. Komag used sensor-activated rinses in cleaning and polishing processes. PCB manufacturers used sensor-activated controls in their developing, stripping and etching processes. None used sensors in manual processes or Gold/Ni Electroplating lines. Dynamic Details also already used sensor-activated in their Hot Air Level, Dry Film Pre-clean, and Automated Cuposit lines and determined to be applicable in Cu Electro Plating. Dynamic Details did not use sensor-activated rinses in Black Oxide, since it was countercurrent already; Dry Film Pre-clean pumice scrubber, since it was a conveyor process; Tin-Lead Plating, since it only had one rinse; and Al oxide rinse since it was already optimized. Hadco already used sensor-activated rinses in most of its processes. In addition to the ones none of the PCB manuctures did not use, Hadco also did not used sensor activated controls in its Cuposit Line since this process needed constant overflow. In addition to the above, Samina I and II did not use sensor activation in any of its electroplating lines since they were prefabricated and could not be modified.

Comparison of Company Responses by Measure _____ *4C-IG Timer Flow Controls*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	Wafer Fab
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	E	In TAB/C4 Operations
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	E,N,A	Appl. in Fab 7-2, Existing in Fab 7-7, NA optimized; rinse quality; delicate process
HADCO	SC-027A PCB Manufacturer	E,N	Not in ID# B-2,C-3 sensor activated,C-1 constant overflow,C-2 manual C-4 cascade no turno
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E,N	In EP; not in SBs, ET, ST, DE since sensor activated; No need in manual CU
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E,N	In EP; not in SBs, ET, ST, DE since sensor activated; No need in manual CU
IBM Corporation	SJ-007A Disk/Head Mfr	E	In Wafer, Fab, Disk, and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M2 and M3, M1 sensor-activity based on other parameters and M4 has no rinse steps
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	8
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	5
(X) Not required for this Sector:	25

Of the head disk manufacturers,IBM used timers in all processes and Komag used timers in Polishing and texturing. but not in cleaning since already sensor-activated based on other parameters. For all PCB manufacturers Timer Controls were redundant due to sensor activated rinsing for Strip-Etch-Strip and not applicable for Gold/ Ni Plating operations due to poor rinse quality. Dynamic Details also already used timer controls in DES, Hot Air Level and Automated Cuposit Lines. Dynamic Details had a project to use timer controls in their Cu Electro Plating line. Dynamic Details did not uses timers in their Black Oxide process, since it was timed by production panels; Dry Film Preclean, since it was sensor-activation; and Tin-Lead Plating, since it only had one rinse. Hadco already used timer controls in Black Oxide Line, Al Oxide/ Pumice Scrubber, Dry Film processing, and Liquid Photo Imaging. Hadco also did not use timer controls in DES since constant overflow is required, in Electrolytic Plating lines since they were all manual. Samina I and II use timer controls in Electroplating lines. Samina I and II also did not uses timer controls in their developers, and scrubbers since they used sensor activated controls. Cuposit was manual and therefore does not need automated controls.

Comparison of Company Responses by Measure ____ *4C-IH Conductivity Flow Controls*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	Wafer Fab
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	N	TAB/C4 Operations have sensor activated rinses and time controls only
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	N	Optimized, rinse quality; delicate process; too much fluctuation
HADCO	SC-027A PCB Manufacturer	E,A,N	Applicable in ID# B-2, Not in ID# C-5 cleanliness by filtration, Not in C-6 by proximity sensors
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Not in EP, prefab'd unmodifiable; SB, ET,ST,DE sensor activation; No need in manual CU
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Not in EP, prefab'd unmodifiable; SB, ET,ST,DE sensor activation; No need in manual CU
IBM Corporation	SJ-007A Disk/Head Mfr	E	In Wafer, Fab, Disk, and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	In M4; M1 sensor-activity based on other parameters and M2 and M3 use timers
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	3
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	6
(X) Not required for this Sector:	25

Head Disk Manufacturers differed on control use. IBM uses conductivity controls in all its processes. Komag uses sensor-activated and timer controls on its processes. PCB Manufacturers also differed on use of conductivity controls. Dynamic Details and Samina I and II did not use conductivity controls in any of their processes and could not modify them since most were prefabricated automated systems. Hadco used conductivity controls in its Black Oxide, Al Oxide/ Pumice Scrubber, and plating lines. Hadco also had a project for adding conductivity controls in DES lines. Dry Film processing line controled cleanliness through filtration and proximity sensors controlled Liquid Photo Image line..

Comparison of Company Responses by Measure 4C-IIA Use in Scrubbers/Cooling Towers

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	A	Wafer Fab, no treated wastewater is used on site.
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	N	Treated process water quality inadequate in TAB/C4 Operations
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	N	Needs pretreatment
HADCO	SC-027A PCB Manufacturer	N	Not used in any process due to lack of water quality
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	No cooling towers, flows negligible in scrubbers
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	No cooling towers, flows negligible in scrubbers
IBM Corporation	SJ-007A Disk/Head Mfr	E	In Wafer, Fab, Disk, and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M1, M2, and M3; Water from M3 already exceeds demand
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	2
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	6
(X) Not required for this Sector:	25

Both head disk manufacturers used process water in scrubbers and cooling towers. None of the PCB manufactuers used process water in cooling towers or scrubberrs. Dynamic Detailed and Hadco would not use process water since water quality for their process water was inadequate. Samina I and II had no cooling towers and their scrubbers' water use was negligible.

Comparison of Company Responses by Measure ***4C-IIB Reuse Process Rinsewater***

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisio	SC-060A Semiconductor	A	Wafer Fab, installed system to treat rinse water for reuse.
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	E	In TAB/C4 Operations
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild Sy	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	A	Still in Research and Development, will notify ESD when implemented
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	E,N	Not in Fab 5,6,7-1,7-3, 7-4, cyanide destruct
HADCO	SC-027A PCB Manufacturer	E,N	ID# C-4 needs high quality rinse water
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N,E	In CU, ET,DE; Not in EP premanufactured unmodifiable; SB&ST, spotting & contamination
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N,E	In CU, ET,DE; Not in EP premanufactured unmodifiable; SB&ST, spotting & contamination
IBM Corporation	SJ-007A Disk/Head Mfr	N	Rinse waters from Wafer, Fab, Disk and Assembly are not of acceptable quality for reuse
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E, N	In M4; Not acceptable quality for other uses in M1, M2, and M3
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwoo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	6
(A) Applicable:	2
(>5) >5 Year Payback:	0
(N) Not Applicable:	6
(X) Not required for this Sector:	24

Head disk manufacturers did not reuse water in most of their processes. IBM's rinse waters are not of acceptable quality for reuse. Komag reuses process rinse water from Sputtering, but other processes also do not have acceptable quality for reuse. PCB Board Manufacturers differed on reuse capabilities. Dynamic Details already reuses process rinse water in Black Oxide, DES, Dry Film Pre-clean, Cu Electro Plating, Strip-Etch-Strip, Manual Cuposit, and Automated Cuposit. Dynamic Details also did not reuse process rinse water in Hot Air Level, Tin-Lead Plating since it needs to be treated. Gold Electroplating and Gold Immersion cannot reuse rinse water due to cyanide. Hadco already reuses rinse water in most of its processes except in the Electroless Gold Plating line due to high quality wastewater needs. Samina I and II reuses rinse water in their Etchers, Cuposits and Developers. Their prefabricated automated Electroplating lines do not reuse rinse water and cannot be modified to include this measure. The Stripper and Scrubber lines cannot reuse rinse water due to dissolved metal spotting and contamination of boards and panel surfaces.

Comparison of Company Responses by Measure 4C-IIC Reuse of Treated Wastewater

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Wafer Fab, no treated wastewater is used on site.
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	N	Treated process water quality inadequate in TAB/C4 Operations
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	A	Still in Research and Development, will notify ESD when implemented
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	E,N	Not in Fab 5, 7-3,7-4
HADCO	SC-027A PCB Manufacturer	E,N	Not in ID# C-1, C-4 does not meet quality requirements for reuse
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	A	From all process lines, scheduled even though payback is greater than five years
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	A	Applicable for all process lines, scheduled even though payback is greater than five years
IBM Corporation	SJ-007A Disk/Head Mfr	N	Treated wastewater is not acceptable quality for reuse
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Treated wastewater is not of sufficient quality for process uses
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	2
(A) Applicable:	3
(>5) >5 Year Payback:	0
(N) Not Applicable:	6
(X) Not required for this Sector:	24

Both head disk manufacturers, IBM and Komag, did not reuse treated wastewater since the quality is unacceptable. All four PCB manufacturers either already used treated wastewater in their process lines or were considering it. Dynamic Details used treated wastewater in most of its lines except Photo (closed loop), screen cleaning (uses pressurized water when needed), and Full Body Gold and Gold Immersion lines. Hadco already reused treated wastewater in all of its processes except for its Electroless Cu and Electroless Ni/Gold lines. Treated Wastewater did not meet quality requirements for reusing in these processes. Samina I and II considered reusing treated wastewater applicable and is scheduling a project even though it has a greater than five year payback.

Comparison of Company Responses by Measure — *4C-IIIA Mechanical Mixers*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Wafer Fab, due to contamination and space limitations.
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	E	In TAB/C4 Operations
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	E, N	Only existing in 7-4,7-6 NA No need, automated line; affects Process
HADCO	SC-027A PCB Manufacturer	N	Not in ID# B-1, B-2, C-1, C-2,C-3,C-4 line process and tank size and design incompatible
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Not in EP, DE,SB, ET, ST premanufactured unmodifiable, existing CU agitation O.K.
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Not in EP, DE,SB, ET, ST premanufactured unmodifiable, existing CU agitation O.K.
IBM Corporation	SJ-007A Disk/Head Mfr	N	Other rinse agitation measures are used in Wafer, Fab, Disk, and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M2; M1 agitates other ways, M3 agitates with tank arrangement, M4 has no cleaning or rinsi
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	3
(A) Applicable:	0
(>5) >5 Year Payback:	0
(N) Not Applicable:	7
(X) Not required for this Sector:	25

PCB manufacturing process preferred other agitition measures over mechanical mixing. Dynamic Details used mechanical mixing in Gold Immersion and Manual Cuposit lines. Mechanical mixing also negatively affects Copper Electroplating Process and Full Gold Line. Hadco used mechanical mixing in Dry Film and Liquid Photo Imaging lines. Samina I and II did not use mechanical mixers on any of its prefabricated lines.

Comparison of Company Responses by Measure — *4C-IIIB Air Agitation*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	Wafer Fab
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	N	TAB/C4 Operations have mechanical mixers only
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	A	Still in Research and Development, will notify ESD when implemented
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	N,A,E	Only Applicable in Fab 1, Exist in Fab 7-7 NA automated line, rinse quality
HADCO	SC-027A PCB Manufacturer	E,N	No in ID# B-2, C-3 quality problems, C-5 no rinse sump, C-6 other agitation measure used
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E,N	In EP, CU; Not in DE, SC, ET, ST, spray rinses, no agitation needed
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E,N	In EP, CU; Not in DE, SC, ET, ST, spray rinses, no agitation needed
IBM Corporation	SJ-007A Disk/Head Mfr	N	Other rinse agitation measures are used in Wafer, Fab, Disk and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	IM1 and M2 agitate other ways, M3 agitates w/ tank arrangement, M4 has no cleaning or rinsin
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	5
(A) Applicable:	2
(>5) >5 Year Payback:	0
(N) Not Applicable:	7
(X) Not required for this Sector:	24

Neither head disk manufacturers used air agitation as the preferred agitation method. PCB Manufacturers preferred other types of agitation for most process lines.Dynamic Details used air agitation in Automated Cuposit. This measure is also applicable for the Black Oxide line. Detailed Dynamic prefers other agitation methods for other processes. Hadco uses air agitation in Black Oxide, Electroless Cu, Electrolytic Plating, and Electroless Gold/Ni lines. Dry Film line has no sump pump. Samina I and II use air agitation in Electroplater and Cuposit. Developer, Etcher, Stripper, and Scrubber are spray rinses that do not need agitation.

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	Wafer Fab
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	N	TAB/C4 Operations have mechanical mixers only
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	N	No need, automated line
HADCO	SC-027A PCB Manufacturer	N	Not used in any process since not compatible to existing systems and product quality
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Not in EP and CU existing agitation OK; Not in DE,SC,ET,ST, spray rinses, no agitation neede
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Not in EP and CU existing agitation OK; Not in DE,SC,ET,ST, spray rinses, no agitation neede
IBM Corporation	SJ-007A Disk/Head Mfr	E	In Wafer, Fab, Disk, and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M2; M1 agitates other ways, M3 agitates with tank arrangement, M4 has no cleaning or rinsi
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	3
(A) Applicable:	0
(>5) >5 Year Payback:	0
(N) Not Applicable:	6
(X) Not required for this Sector:	25

Of the head disk manufacturers IBM used sonics for agitation in all its processes and Komag used sonics in its Polishing lines. None of the PCB manufacturers used sonics because most lines were automated, they used other measures for agitation, or there were concerns regarding impact on product quality.

Comparison of Company Responses by Measure — *4C-IIID Tank Arrangement*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	Wafer Fab
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	E	In TAB/C4 Operations
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	A	Still in Research and Development, will notify ESD when implemented
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	E,N	Not in Fab 3,4-3, 5 closed loop
HADCO	SC-027A PCB Manufacturer	E,A,N	Applicable in ID# B-1 (not scheduled). C-1 tank design incompatible, C-5 no rinse sump
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	E,N	In EP, CU, Not in DE, SC, ET, ST, spray rinses, no agitation needed
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	E,N	In EP, CU, Not in DE, SC, ET, ST, spray rinses, no agitation needed
IBM Corporation	SJ-007A Disk/Head Mfr	E	In Wafer, Fab, Disk, and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M1, M2 and M3; M4 has no cleaning or rinsing
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	8
(A) Applicable:	2
(>5) >5 Year Payback:	0
(N) Not Applicable:	5
(X) Not required for this Sector:	24

Both head disk manufacturers, Komag and IBM, used tank arrangement in all rinsing processes for agitation. All PCB Manufacturers used tank arrangement in their Plating Lines. In addition Hadco and Dynamic Details used tank arrangement agitation in Black Oxide and Develop/Etch/Strip. Dynamic Details and Samina I and II used tank arrangement in Cuposit lines. Dynamic Details also used tank arrangement in Dry Film Pre-clean Schmid and Scrubber, and Hot Air Level. Aluminum Oxide did not need agitation and was automated. Hadco used tank arrangement for agitation in Liquid Photo Imaging lines. Hadco did not use tank arrangement in their Electroless Copper line since tank size and design were incompatible with tank arrangement. Dry Film also had no sump pump. Samina I and II did not use tank arrangement in their Developer, Etcher, Stripper, and Scrubber since they use spray rinses that do not need agitation.

Comparison of Company Responses by Measure — *4C-IIIE Workpiece Agitation*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	Wafer Fab
Hewlett Packard	SJ-003A Semiconductor	X	
Intel Corporation D2P3	SC-249A Semiconductor	X	
Intel Corporation, D2	SC-028A Semiconductor	N	TAB/C4 Operations have mechanical mixers only
Linear Technology	MI-006A Semiconductor	X	
Lockheed Martin Fairchild S	MI-072A Semiconductor	X	
LSI Logic	SC-046A Semiconductor	X	
Micrel Inc.	SJ-258A Semiconductor	X	
Seagate Technology	MI-061A Semiconductor	X	
Unisil	SC-236A Semiconductor	X	
UniSil Corp.	SC-295A Semiconductor	X	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	X	
Dynamic Details	MI-014A PCB Manufacturer	N,A,E	Applicable in Fab 1, Existing in 7-6,7-7 NA Automated line; Done manually
HADCO	SC-027A PCB Manufacturer	E,N	Not in ID# B-2 no agitation needed, Not in ID#C-3 product quality problems, C-4 manual
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Not in EP and CU existing agitation OK; Not in DE,SC,ET,ST, spray rinses, no agitation neede
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N,E	Not in EP and CU existing agitation OK; Not in DE,SC,ET,ST, spray rinses, no agitation neede
IBM Corporation	SJ-007A Disk/Head Mfr	E	In Wafer, Fab, Disk, and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E,N	In M1; M2 agitates other ways, M3 agitates w/ tank arrangement, M4 has no cleaning or rinsin
Read-Rite Corp.	MI-004A Disk/Head Mfr	X	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	6
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	6
(X) Not required for this Sector:	25

Head disk manufacturers use various methods of agitation. IBM used workpiece agitation in all its processes. Komag only used workpiece agitation in its Cleaning processes. Of the PCB manufacturers, Hadco and Dynamic Details used workpiece agitation in their Cuposit and Black Oxide Lines. Hadco also used workpiece agitation in Electrolytic Plating and Dry Film. Samina I and II did not use workpiece agitation in any of its lines.

Comparison of Company Responses by Measure — *4D-IA Spray Rinse*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Not in wafer fab, have done studies and the results are that this cannot be done.
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	In D2(P1/P2) Manufacturing
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Cleaning solution will foam like soap; water on only when needed; sinks too old for upgrade
LSI Logic	SC-046A Semiconductor	E,N	In 3 sinks (in Strip, Spray and DNS sinks) had high cost, cannot replace all, Not in polishing
Micrel Inc.	SJ-258A Semiconductor	A	Will consider during replacement
Seagate Technology	MI-061A Semiconductor	A	Still in Research and Development, will notify ESD when implemented
Unisil	SC-236A Semiconductor		
UniSil Corp.	SC-295A Semiconductor	N	Stated that old process stations are too costly to convert, although 5B-5G were not completed
Vishay - Siliconix, Inc.	SC-033A Semiconductor	E,A	Schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	X	
HADCO	SC-027A PCB Manufacturer	X	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	X	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	X	
IBM Corporation	SJ-007A Disk/Head Mfr	E	In Wafer, Fab, Disk, and Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	E	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	9
(A) Applicable:	3
(>5) >5 Year Payback:	0
(N) Not Applicable:	4
(X) Not required for this Sector:	18

Spray rinses were applicable for all head disk manufactures: IBM, Komag and Read-Rite Corporations. Six semiconductor manufactures already used spray rinses in their processes (50%). Vishay-Siliconix, who already used spray rinses, was considering expanding its use. Seagate was researching and developing a project for using spray rinse. Micrel said it would consider spray rinses during replacement. LSI used spray rinses in three sinks but found that their high cost prevented them from applying to other sinks and polishing. Analog Devices did not use spray rinses in its Wafer Fab since they had done studies that showed that it could not be done. Unisil and Lockheed Martin said old processes were too expensive to convert to spray rinse. Lockheed Martin also said cleaning solution would foam like soap in spray washes and that they currently used water only when needed.

Comparison of Company Responses by Measure — *4D-IB Hot Ultra Pure*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	A	In wafer fab, needs further study.
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	In D2(P1/P2) Manufacturing
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	process limitations and space constraints
LSI Logic	SC-046A Semiconductor	E	
Micrel Inc.	SJ-258A Semiconductor	N	Would effect product quality
Seagate Technology	MI-061A Semiconductor	E,N	No need in texturize, keeping discs wet; nor in Oliver wash process, drying w/ centrifugal forc
Unisil	SC-236A Semiconductor	E	
UniSil Corp.	SC-295A Semiconductor	N	Stated that old process stations are too costly to convert, although 5B-5G were not completed
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N	Negative product quality impact
Dynamic Details	MI-014A PCB Manufacturer	X	
HADCO	SC-027A PCB Manufacturer	X	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	X	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	X	
IBM Corporation	SJ-007A Disk/Head Mfr	N	Other rinse reduction measures used.
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Uses spray rinses to optimize water
Read-Rite Corp.	MI-004A Disk/Head Mfr	E	In use at Gold Station.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	8
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	7
(X) Not required for this Sector:	18

Of the head disk manufactures, Read-Rite used hot ultra pure water in its Gold Station. Komag and IBM said they used other rinse reduction measures. Seven semiconductor manufactures (58%) already used hot ultra pure water. Analog Devices was considering using hot ultra pure water in its Wafer Fab, but this use needed further study. Both Unisil facilities, Micrel, and Lockheed Martin did not consider hot ultra pure water conversion applicable due to process limitations of old equipment, lack of space, and negative quality impact.

Comparison of Company Responses by Measure — *4D-IC Megasonic Rinsing*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	A	In wafer fab needs further review with process engineering.
Hewlett Packard	SJ-003A Semiconductor	N	This type of rinsing jeopardizes the product quality and ergonomic health of workers
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	In D2(P1/P2) Manufacturing
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	process limitations and possible risk impacts
LSI Logic	SC-046A Semiconductor	N	Disruptive to 0.15 Micron Technology (lithography)
Micrel Inc.	SJ-258A Semiconductor	E	
Seagate Technology	MI-061A Semiconductor	E	
Unisil	SC-236A Semiconductor		
UniSil Corp.	SC-295A Semiconductor	E	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	E,A	Used in process where appropriate, schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	X	
HADCO	SC-027A PCB Manufacturer	X	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	X	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	X	
IBM Corporation	SJ-007A Disk/Head Mfr	E,N	In Wafer,Fab, not in Disk or Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Uses spray rinses to optimize water
Read-Rite Corp.	MI-004A Disk/Head Mfr	E	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	9
(A) Applicable:	2
(>5) >5 Year Payback:	0
(N) Not Applicable:	5
(X) Not required for this Sector:	18

Of the head disk manufactures, Read Rite and IBM used megasonic rinsing. Komag used spray rinsing to optimize water use. Seven semiconductor manufactures (58%) already used megasonic rinsing. Analog Devices was considering using in Wafer Fab, but this measure needed further review by process engineering. Hewlett Packard stated that megasonic rinsing jeopardized product quality and ergonomic health of workers. Lockheed Martin stated that megasonic rinsing had process limitations and other possible risk impacts. LSI stated that megasonic rinsing disrupted their process.

Comparison of Company Responses by Measure — *4D-ID Spin Rinsing*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	In wafer Fab
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	In D2(P1/P2) Manufacturing
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	process limitations and possible risk impacts
LSI Logic	SC-046A Semiconductor	E,N	Not in Strip, Wafer Scrubbers and DNS Clean Sinks; deemed too expensive
Micrel Inc.	SJ-258A Semiconductor	E	
Seagate Technology	MI-061A Semiconductor	E	
Unisil	SC-236A Semiconductor		
UniSil Corp.	SC-295A Semiconductor	E	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	E,A	Used in process where appropriate, schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	X	
HADCO	SC-027A PCB Manufacturer	X	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	X	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	X	
IBM Corporation	SJ-007A Disk/Head Mfr	E,N	In Wafer,Fab, not in Disk or Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Uses spray rinses to optimize water
Read-Rite Corp.	MI-004A Disk/Head Mfr	E	
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	12
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	4
(X) Not required for this Sector:	18

Of the head disk manufactures, Read Rite and IBM used spin rinsing. Komag used spray rinsing to optimize water use. Ten semiconductor manufacturers (83%) already used spin rinsing. Vishay-Siliconix, one of the facilities already using spin rinsing, was considering expanding its use where appropriate. LSI used spin rinsing in three sinks, but said it was too expensive to expand to other sinks. Lockheed did not use spin rinsing due to process limitations and possible risk impacts.

Comparison of Company Responses by Measure *4D-IE Rinse Tank Geometry*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Not in wafer fab, 2 boat 4" setup, optimized now.
Hewlett Packard	SJ-003A Semiconductor	E,A	Project to convert 6"Fab to 4"
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	In D2(P1/P2) Manufacturing
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	E	
LSI Logic	SC-046A Semiconductor	E,N	Not in Polishing, Wafer Scrubbers since no rinse tanks
Micrel Inc.	SJ-258A Semiconductor	N	Existing tanks cannot be changed
Seagate Technology	MI-061A Semiconductor	A	Still in Research and Development, will notify ESD when implemented
Unisil	SC-236A Semiconductor	E	
UniSil Corp.	SC-295A Semiconductor	N	Stated that old process stations are too costly to convert, although 5B-5G were not completed
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N	Cannot change cassettes/wafer handling
Dynamic Details	MI-014A PCB Manufacturer	X	
HADCO	SC-027A PCB Manufacturer	X	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	X	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	X	
IBM Corporation	SJ-007A Disk/Head Mfr	E,N	In Wafer,Fab, not in Disk or Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Use other RCMs.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	9
(A) Applicable:	2
(>5) >5 Year Payback:	0
(N) Not Applicable:	7
(X) Not required for this Sector:	18

Of the head disk manufacturers, both IBM and Komag already used rinse tank geometry improvements. Read-Rite used other measures to reduce water use. Seven semiconductor manufacturers (58%) already improved rinse tank geometry. Hewlett Packard was improving tank geometry as part of their conversion from 6-inch Fab to 4-inch. Seagate was researching and developing improving rinse tank geometry. Analog Devices already had a two-boat 4-inch setup that was already optimized. Both Unisil facilities and Micrel cited the high cost of changes processes as an obstacle.

Comparison of Company Responses by Measure ***4D-IF Idle Flow Reduction***

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	In wafer fab, need to continue monitoring existing set-up.
Hewlett Packard	SJ-003A Semiconductor	A	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	In D2(P1/P2) Manufacturing
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	E	
LSI Logic	SC-046A Semiconductor	E,A,N	Applicable for Polishing, Wafer Scrubbers, Strip Sinks, DNS Clean; No idle time in Spray tools
Micrel Inc.	SJ-258A Semiconductor	A	Will consider during replacement
Seagate Technology	MI-061A Semiconductor	E,N	Autohandler in texture and after ultrasonic cleaning, Oliver flushes avoids bio contamination
Unisil	SC-236A Semiconductor	E	
UniSil Corp.	SC-295A Semiconductor	E	
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	X	
HADCO	SC-027A PCB Manufacturer	X	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	X	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	X	
IBM Corporation	SJ-007A Disk/Head Mfr	E,N	In Wafer,Fab, not in Disk or Assembly
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	There are no wet decks with continuous flow rinses.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	11
(A) Applicable:	4
(>5) >5 Year Payback:	0
(N) Not Applicable:	4
(X) Not required for this Sector:	18

Of the head disk manufactures, both IBM and Komag already reduce idle flows. Read-Rite did not have wet decks with continuous flow rinses. Nine semiconductor manufacturers (75%) already employed idle flow reduction. LSI Logic had a project to expand use of this measure. Hewlett Packard, Micrel and Vishay-Siliconix had projects to include idle flow reduction in processes.

Comparison of Company Responses by Measure 4D-II Wet Benches with Built-In Recycling

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	A	Could be implemented in certain areas. Easy to recycle the whole wafer fab water.
Hewlett Packard	SJ-003A Semiconductor	N	Evaluated on a case by case basis by process engineers
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	In D2(P1/P2) Manufacturing
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	floor space constraints
LSI Logic	SC-046A Semiconductor	E,N	Not Applicable for DNS Clean Sinks
Micrel Inc.	SJ-258A Semiconductor	A	Will consider during replacement
Seagate Technology	MI-061A Semiconductor	A	Still in Research and Development, will notify ESD when implemented
Unisil	SC-236A Semiconductor		
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Evaluated as sinks are replaced
Dynamic Details	MI-014A PCB Manufacturer	X	
HADCO	SC-027A PCB Manufacturer	X	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	X	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	X	
IBM Corporation	SJ-007A Disk/Head Mfr	N	Not in Wafer, Fab, Disk or Assembly, other rinse reduction measures are used.
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Facility does not manufacture semiconductors
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	There are no wet decks with continuous flow rinses.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	

Number of companies assessing measure as:

(E) Existing:	4
(A) Applicable:	4
(>5) >5 Year Payback:	0
(N) Not Applicable:	6
(X) Not required for this Sector:	18

None of the head disk manufactures used wet benches with built-in recycling. Four semiconductor manufacturers considered this built-in recycling existing and four considered this measure applicable. Analog Devices could have implemented in certain areas, but said it may be easier to recycle the whole fab water. Micrel and Vishay-Siliconix said they would consider built-in recycling wet benches during replacement. Seagate had a project for built-in recycling wet benches in research and development. Lockheed could not use these benches due to space constraints.

Comparison of Company Responses by Measure 5A-IA Sidestream Filtration for Cooling Towers

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	N	Not feasible for D2P3 cooling towers
Intel Corporation, D2	SC-028A Semiconductor	N	Not feasible in D2 (P1/P2) cooling towers
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	
LSI Logic	SC-046A Semiconductor	E	
Micrel Inc.	SJ-258A Semiconductor	N	
Seagate Technology	MI-061A Semiconductor	E	
Unisil	SC-236A Semiconductor	N	No cooling towers
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N	Uses standard Cooling Tower Technology
Dynamic Details	MI-014A PCB Manufacturer	N	Closed Loop
HADCO	SC-027A PCB Manufacturer	N	No cooling towers
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible
IBM Corporation	SJ-007A Disk/Head Mfr	N	Cooling tower uses treated rinse water which has low solids.
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Rinse water used is high quality so no filtration required
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Improve COCs in cooling towers more cost effective.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	No cooling towers
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No cooling towers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	E	
Doubletree Hotel	SJ-DOUB Comm: Hotel	E	
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	
Paramount Great America	SC-PARA Comm: Theme Park	N	No cooling tower
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No cooling towers
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	Not feasible (no explanation why)
San Jose State University	SJ-SJSU Inst: Educational	N	
Santa Clara University	SC-UNIV Inst: Educational	N	
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	Will be also replacing cooling tower with more water effiencient model.
San Jose Medical Center	SJ-SJME Inst: Hospital		
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	

Number of companies assessing measure as:

(E) Existing:	7
(A) Applicable:	0
(>5) >5 Year Payback:	0
(N) Not Applicable:	24
(X) Not required for this Sector:	0

Seven facilities (21%) already used side-stream filtration. Nine facilities (27%) either did not have cooling tower or were closed loop. Thirteen (39%) noted this measure as not applicable and provided no justification. IBM and Komag did not require sidestream filtration since their reclaimed process water was of sufficient quality for use as cooling tower makeup. Read-Rite was focusing on increasing cycles of concentration without sidestream filtration as well. Good Samaritan Hospital said they would be replacing is cooling tower with a more water efficient model.

Comparison of Company Responses by Measure ***5A-IB Ozonation for Cooling Towers***

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	
Hewlett Packard	SJ-003A Semiconductor	N	Found to be ineffective and damaging after a trial period
Intel Corporation D2P3	SC-249A Semiconductor	N	Not feasible for D2P3 cooling towers
Intel Corporation, D2	SC-028A Semiconductor	N	Not feasible in D2 (P1/P2) cooling towers
Linear Technology	MI-006A Semiconductor	E	
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Invalid basis for water reduction, not guarenteed, too much cost and hazard (not evaluted in S
LSI Logic	SC-046A Semiconductor	N	
Micrel Inc.	SJ-258A Semiconductor	N	
Seagate Technology	MI-061A Semiconductor	N	
Unisil	SC-236A Semiconductor	N	No cooling towers
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Not evaluated or scheduled
Dynamic Details	MI-014A PCB Manufacturer	N	
HADCO	SC-027A PCB Manufacturer	N	No cooling towers
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible
IBM Corporation	SJ-007A Disk/Head Mfr	N	Cooling tower already achieves high cycles of concentrations.
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Ozonation was tested and found to damage cooling tower components
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Water use reduction by ozonation is not based on valid engineering data.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	No cooling towers
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No cooling towers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	A	No evaluation and not scheduled
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	Tried this before; not effective
Paramount Great America	SC-PARA Comm: Theme Park	N	No cooling tower
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No cooling towers
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	Not feasible (no explanation why)
San Jose State University	SJ-SJSU Inst: Educational	N	
Santa Clara University	SC-UNIV Inst: Educational		
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	Will be also replacing cooling tower with more water effiencient model.
San Jose Medical Center	SJ-SJME Inst: Hospital		
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	

Number of companies assessing measure as:

(E) Existing:	2
(A) Applicable:	2
(>5) >5 Year Payback:	0
(N) Not Applicable:	26
(X) Not required for this Sector:	0

Only two facilities already used ozonation and only two facilities considered ozonation applicable. Nine facilities (27%) either did not have cooling tower or had closed loop systems. Thirteen facilities (39%) provided no justification for not using ozonation. Seven facilities were concerned with ineffectiveness and damage to cooling tower using this facility based on onsite trials and research.

Comparison of Company Responses by Measure *5A-IC SBWR for Cooling Towers*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	SBWR not available, if could get connected, would use.
Hewlett Packard	SJ-003A Semiconductor	N	SBWR not available
Intel Corporation D2P3	SC-249A Semiconductor	N	SBWR recycled water quality inadequate
Intel Corporation, D2	SC-028A Semiconductor	N	SBWR water quality inadequate
Linear Technology	MI-006A Semiconductor	A	Already using 2/3 process water, not scheduled
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Currently using process water (RO reject)
LSI Logic	SC-046A Semiconductor	N	SBWR not available
Micrel Inc.	SJ-258A Semiconductor	N	SBWR not available
Seagate Technology	MI-061A Semiconductor	N	SBWR not available
Unisil	SC-236A Semiconductor	N	No cooling towers, SBWR not available
UniSil Corp.	SC-295A Semiconductor	N	SBWR not available
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N	Would increase cooling tower blowdown/ decrease Bay discharge
Dynamic Details	MI-014A PCB Manufacturer	N	SBWR not available
HADCO	SC-027A PCB Manufacturer	N	No cooling towers, SBWR not available
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible, SBWR not available
IBM Corporation	SJ-007A Disk/Head Mfr	N	SBWR not available
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	SBWR not available
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Not in SBWR service area.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	SBWR not available
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	No cooling towers
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No cooling towers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	N	Not considered cost effective due to increase in cycle time although 5D-5G were not complet
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	SBWR not available
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	SBWR not available
Paramount Great America	SC-PARA Comm: Theme Park	N	No cooling tower
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No cooling towers
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	Not feasible (no explanation why)
San Jose State University	SJ-SJSU Inst: Educational	E	
Santa Clara University	SC-UNIV Inst: Educational	N	Unwilling to use SBWR water due to increased maintenance, etc. 5B-5G not completed
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	SBWR not available
San Jose Medical Center	SJ-SJME Inst: Hospital	N	SBWR not available
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	SBWR not available

Number of companies assessing measure as:

(E) Existing:	1
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	31
(X) Not required for this Sector:	0

Only twelve facilities (36%) had access to SBWR recycled water. Of these, one already used SBWR for cooling tower makeup and two were considering using this water for cooling tower purposes. Three of these facilities within SBWR's service area did not have cooling towers. Two others already used process water in their cooling towers. The rest of the facilities near SBWR were concerned with water quality. The City will publish new customer success stories for SBWR water use and provide to prospective customers.

Comparison of Company Responses by Measure 5A-ID Replace with Mechanical Cooling

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Mechanical cooling cannot be used for the chillers.
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	N	Not feasible for D2P3
Intel Corporation, D2	SC-028A Semiconductor	N	Not feasible in D2 (P1/P2)
Linear Technology	MI-006A Semiconductor	N	Rejection heat load is too great
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	cost prohibitive
LSI Logic	SC-046A Semiconductor	E	Have some mechanical cooling
Micrel Inc.	SJ-258A Semiconductor	N	
Seagate Technology	MI-061A Semiconductor	N	Cooling for large clean rooms would result in excessive power consumption
Unisil	SC-236A Semiconductor	N	No cooling towers
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N	High cost, no space
Dynamic Details	MI-014A PCB Manufacturer	N	Need for more power
HADCO	SC-027A PCB Manufacturer	N	No cooling towers
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible
IBM Corporation	SJ-007A Disk/Head Mfr	N	Because cooling tower uses treated rinse water, no discharge reduction would result.
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Since using reclaimed water, not water reduction using this measure
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Cost prohibitive.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	No cooling towers
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No cooling towers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	E	
Doubletree Hotel	SJ-DOUB Comm: Hotel	N	
Fairmont Hotel	SJ-FAIR Comm: Hotel	N	
Paramount Great America	SC-PARA Comm: Theme Park	N	No cooling tower
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No cooling towers
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	SBWR not available
San Jose State University	SJ-SJSU Inst: Educational	N	
Santa Clara University	SC-UNIV Inst: Educational		
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	N	Cooling towers are more efficient
San Jose Medical Center	SJ-SJME Inst: Hospital		
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	

Number of companies assessing measure as:

(E) Existing:	4
(A) Applicable:	0
(>5) >5 Year Payback:	0
(N) Not Applicable:	26
(X) Not required for this Sector:	0

Four facilities already used mechanical cooling. Nine facilities (27%) did not use cooling systems or had closed-loop systems. None of the other facilities found this measure applicable citing that mechanical cooling was not energy efficient and was cost prohibitive.

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Our water treatment system is sufficient.
Hewlett Packard	SJ-003A Semiconductor	E	
Intel Corporation D2P3	SC-249A Semiconductor	E	
Intel Corporation, D2	SC-028A Semiconductor	E	
Linear Technology	MI-006A Semiconductor	N	Space constraints
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Not needed, may divert RO reject past neutralization
LSI Logic	SC-046A Semiconductor	E	
Micrel Inc.	SJ-258A Semiconductor	A	
Seagate Technology	MI-061A Semiconductor	N	Current water needs no additional treatment for reuse/recycle.
Unisil	SC-236A Semiconductor	N	No cooling towers
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	A	Schedule to be determined
Dynamic Details	MI-014A PCB Manufacturer	N	Not economical
HADCO	SC-027A PCB Manufacturer	N	No cooling towers
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Closed loop cooling, <20 gallons of week used so negligible
IBM Corporation	SJ-007A Disk/Head Mfr	N	Cooling tower uses treated rinse water which has low hardness.
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Rinse water used is high quality so no filtration required
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Improve COCs in cooling towers more cost effective.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	E	
Exchange Linen Services	SJ-022C Oth Ind: Laundry	N	No cooling towers
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	No cooling towers
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	A	No evaluation and not scheduled
Doubletree Hotel	SJ-DOUB Comm: Hotel	E	Installed in 1995 - Cost = $50K
Fairmont Hotel	SJ-FAIR Comm: Hotel	A	Review for operation
Paramount Great America	SC-PARA Comm: Theme Park	N	No cooling tower
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	N	No cooling towers
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	N	No beneficial effect (no explanation why)
San Jose State University	SJ-SJSU Inst: Educational	N	
Santa Clara University	SC-UNIV Inst: Educational		
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	E	Will be also replacing cooling tower with more water effiencient model.
San Jose Medical Center	SJ-SJME Inst: Hospital		
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	N	

Number of companies assessing measure as:

(E) Existing:	7
(A) Applicable:	4
(>5) >5 Year Payback:	0
(N) Not Applicable:	19
(X) Not required for this Sector:	0

Seven facilities (33%) already used softening in their cooling towers and four found this measure applicable. Nine facilities (27%) did not use cooling systems or had closed-loop systems. Five non-applicable facilities said they did not need softening in their cooling towers. Two non-applicable facilities had space constraints or found the measure cost prohibitive. Read-Rite was concentrating on increasing cycles of concentration without softening. Six non-applicable facilities provided no justification.

Comparison of Company Responses by Measure — *5A-II Reverse Osmosis*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	E	Recently replaced our old 1-stage RO unit with a 2-stage unit on 4/1/99.
Hewlett Packard	SJ-003A Semiconductor		A high efficiency RO already exists (although not relevant), did not understand for reuse
Intel Corporation D2P3	SC-249A Semiconductor	N	Did not understand that this was for process reuse
Intel Corporation, D2	SC-028A Semiconductor		Did not understand for process reuse
Linear Technology	MI-006A Semiconductor	N	Space and power distribution unavailable
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Risk to product, cost prohibited (not evaluated in 5A-5G)
LSI Logic	SC-046A Semiconductor		Was noted as Existing but only for pretreatment, did not understand was for pretreatment
Micrel Inc.	SJ-258A Semiconductor	E,N	Micrel uses 2nd stage RO, but does not reuse other process waters
Seagate Technology	MI-061A Semiconductor	E,N	Uses a second pass RO, but did not evaluate reusing process water.
Unisil	SC-236A Semiconductor		Already does reclaim water DI water for reuse without additional treatment
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N, >5	Evaluating 2nd pass RO for RO reject
Dynamic Details	MI-014A PCB Manufacturer	A	
HADCO	SC-027A PCB Manufacturer		Did not understand for reuse
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer		Did not understand that this was for reuse
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Did not understand that this was for reuse
IBM Corporation	SJ-007A Disk/Head Mfr	N,>5	Second pass RO with ion exchange softening pretreatment
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Use of RO for wastewater reuse has not been proven in hard disk manufacturing industry.
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Reuse of process water for DI water production is not viable w/o signif risk to product yield.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	Reuse of wastewater can be accomplished with existing equipmen, not applicable to laundry
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	Does not apply to paper board manufacturing; already reusing 1000 gpm w/o treatment syste
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	E	
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	No process water of sufficient quality for reuse due to homeless laundering
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	No process water
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	No process water
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	No process water

Number of companies assessing measure as:

(E) Existing:	4
(A) Applicable:	1
(>5) >5 Year Payback:	2
(N) Not Applicable:	12
(X) Not required for this Sector:	11

Dynamic Details is the only company that cited plans to use reverse osmosis for general reuse. The City will likely follow this project, with the intent of sharing the outcomes with other companies. Three facilities used reverse osmosis only as a second pass RO to reduce RO reject. Vishay-Siliconix found second pass RO to be too expensive. Ten facilities (30%) did not have process water. Eight facilities (24%) did not understand that reverse osmosis was for reusing process or treated wastewater and not for pretreating City water. Unisil and Exchange Linen Services did not need RO to reuse process water. Two head disk manufacturers and one semiconductor did not want to risk their product quality.

Comparison of Company Responses by Measure — *5A-III High Efficiency RO*

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Did not understand for process reuse
Hewlett Packard	SJ-003A Semiconductor		Did not understand for process reuse
Intel Corporation D2P3	SC-249A Semiconductor	E	Did not understand that this was for process reuse
Intel Corporation, D2	SC-028A Semiconductor	E	
Linear Technology	MI-006A Semiconductor	E	2nd Pass RO
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Risk to product, not technically viable
LSI Logic	SC-046A Semiconductor	A	Greater than 5 year payback, but installed
Micrel Inc.	SJ-258A Semiconductor	E	
Seagate Technology	MI-061A Semiconductor	E	
Unisil	SC-236A Semiconductor	E	
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	E	
Dynamic Details	MI-014A PCB Manufacturer	N	no need for UPW
HADCO	SC-027A PCB Manufacturer	E	
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer	N	
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Did not understand that this was for reuse
IBM Corporation	SJ-007A Disk/Head Mfr	N	Additional recovery from RO reject is evaluated as a project.
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	E	
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Reuse of process water for DI water production is not viable w/o signif risk to product yield.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	N	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	Not applicable to laundry
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	N	Does not apply to paper board manufacturing
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	N	Current R.O. system is adequate.
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	No process water of sufficient quality for reuse due to homeless laundering
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	No process water
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	No process water
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	No process water

Number of companies assessing measure as:

(E) Existing:	9
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	10
(X) Not required for this Sector:	11

Eleven facilities (36%) already used high efficiency RO and one facility considered this measure applicable. One of these facilities, LSI Logic, installed this project even though the payback was greater than five years. Eleven of the not applicable facilities did not have process water. One was using RO Reject for other uses, two found existing RO systems adequate and three provided no justification for stating non-applicable.

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	Did not understand for process reuse
Hewlett Packard	SJ-003A Semiconductor		Did not understand for process reuse
Intel Corporation D2P3	SC-249A Semiconductor	N	Did not understand that this was for process reuse
Intel Corporation, D2	SC-028A Semiconductor		Did not understand for process reuse
Linear Technology	MI-006A Semiconductor	N	Space unavailable for waste treatment IX
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Risk to product, not technically viable
LSI Logic	SC-046A Semiconductor		Did not understand was for reuse
Micrel Inc.	SJ-258A Semiconductor	N	Although not evaluated in Worksheets 5B-5G as directed, deemed to costly
Seagate Technology	MI-061A Semiconductor	N	TOC Concerns
Unisil	SC-236A Semiconductor		
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N	Not a cooling or HPW technology
Dynamic Details	MI-014A PCB Manufacturer	E	
HADCO	SC-027A PCB Manufacturer		Did not understand for reuse
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer		Did not understand that this was for reuse
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Did not understand that this was for reuse
IBM Corporation	SJ-007A Disk/Head Mfr	N,>5	Second pass RO with ion exchange softening pretreatment
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Use of ion exchange for reuse has not been proven in hard disk manufacturing industry.
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Reuse of process water for DI water production is not viable w/o signif risk to product yield.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	Not applicable to laundry
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	Not applicable technology for paperboard reuse
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	Not applicable technology for paperboard reuse
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	No process water of sufficient quality for reuse due to homeless laundering
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	No process water
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	No process water
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	No process water

Number of companies assessing measure as:

(E) Existing:	1
(A) Applicable:	0
(>5) >5 Year Payback:	1
(N) Not Applicable:	11
(X) Not required for this Sector:	14

No facilities used ion exchange for reuse. Fourteen facilities (42%) had no process wastewater where ion exchange would increase reuse. Nine facilities (27%) did not understand that IX system was for reuse not pretreatment of City water. Five facilities had water quality concerns with concerns such as TOC, reliability, and product contamination when using IX for reuse. The rest either cited spaced constraints or cost or provided no justification.

Comparison of Company Responses by Measure 5A-V Electrodeionization (EDI)

Company Name	Permit # / Comp Type	Assessment of Measure and Comments	
Analog Devices, PMI Divisi	SC-060A Semiconductor	N	To be reviewed in near future.
Hewlett Packard	SJ-003A Semiconductor	A	Project to recycle process water using EDI
Intel Corporation D2P3	SC-249A Semiconductor	N	Did not understand that this was for process reuse
Intel Corporation, D2	SC-028A Semiconductor		Did not understand for process reuse
Linear Technology	MI-006A Semiconductor	N	Space and power distribution unavailable
Lockheed Martin Fairchild S	MI-072A Semiconductor	N	Risk to product, not technically viable
LSI Logic	SC-046A Semiconductor	N	
Micrel Inc.	SJ-258A Semiconductor	N	Although not evaluated in Worksheets 5B-5G as directed, deemed to costly
Seagate Technology	MI-061A Semiconductor	N	TOC Concerns
Unisil	SC-236A Semiconductor		
UniSil Corp.	SC-295A Semiconductor		
Vishay - Siliconix, Inc.	SC-033A Semiconductor	N	Too expensive (not evaluated for costs in S5), non-standard technology
Dynamic Details	MI-014A PCB Manufacturer	N	No need
HADCO	SC-027A PCB Manufacturer	N	Not compatible with existing treatment systems
Sanmina Corp. Plant I	SJ-022A PCB Manufacturer		Did not understand that this was for reuse
Sanmina Corp. Plant II	SJ-043A PCB Manufacturer	N	Did not understand that this was for reuse
IBM Corporation	SJ-007A Disk/Head Mfr	N	No application for EDI was identified for treating wastewater for reuse.
Komag Inc. Bldg 10	SJ-341A Disk/Head Mfr	N	Use of EDI for reuse has not been proven in hard disk manufacturing industry.
Read-Rite Corp.	MI-004A Disk/Head Mfr	N	Reuse of process water for DI water production is not viable w/o signif risk to product yield.
Sorrento Cheese Co.	SJ-016C Oth Ind: Food Processing	X	USDA milk processing regulations prohibit, Appendix D of Pasteurized Milk Ordinance
Exchange Linen Services	SJ-022C Oth Ind: Laundry	X	Not applicable to laundry
California Paperboard Corp.	SC-005C Oth Ind: Paperboard	X	Not applicable technology for paperboard reuse
Jefferson Smurfit	SC-003C Oth Ind: Paperboard	X	Not applicable technology for paperboard reuse
Doubletree Hotel	SJ-DOUB Comm: Hotel	X	
Fairmont Hotel	SJ-FAIR Comm: Hotel	X	
Paramount Great America	SC-PARA Comm: Theme Park	X	
Santa Clara County, Elmwo	MI-ELMW Inst: Correctional	X	No process water of sufficient quality for reuse due to homeless laundering
Santa Clara County, Main C	SJ-MAIN Inst: Correctional	X	No process water
San Jose State University	SJ-SJSU Inst: Educational	X	
Santa Clara University	SC-UNIV Inst: Educational	X	No process water
Good Samaritan Hospital	SJ-GOOD Inst: Hospital	X	
San Jose Medical Center	SJ-SJME Inst: Hospital	X	
Santa Clara Valley Medical	SJ-SCVM Inst: Hospital	X	No process water

Number of companies assessing measure as:

(E) Existing:	0
(A) Applicable:	1
(>5) >5 Year Payback:	0
(N) Not Applicable:	14
(X) Not required for this Sector:	14

Hewlett Packard was the only company to aggressively evaluate and research this measure. Fourteen facilities (42%) had no process wastewater that EDI could impact for reuse. LSI Logic already used this technology, but took it out in 1999. Analog Devices was considering future review of this measure. Seagate technology had TOC concerns, preventing reuse. Other companies either did not want to take the risk because it was a new technology, did not understand that the system was for reuse, or provided no justification.

Appendix E: Flow Audit Study Projects Summary

Flow Audit Study Projects Summary

Company Information		*#*	*Description*	*Chg in Flow (gpd)*	*Capital Cost*	*Annual Benefit*	*Payback (Years)*	*Project Completion Date*	*Comments*	*Done*
Doubletree Hotel Commercial: Hotel	SJ-DOUB	1	ULFTs in Public Area	3,800	$26,100	$6,200	4.21	03/00		☐
Doubletree Hotel Commercial: Hotel	SJ-DOUB	2	Increase CT cycles	2,901	$50,000	($3,666)	-13.64		Negative payback; Not scheduled	☐
Doubletree Hotel Commercial: Hotel	SJ-DOUB	3	ULFTs in Guest Rooms (2nd Half)	2,975	$92,055	$4,727	19.47		Not scheduled. Completed retrofit of half of guest room units 3/00.	☐
Fairmont Hotel Commercial: Hotel	SJ-FAIR	1	ULFTs and Urinals	4,577	$159,694	$7,457	21.42	N/A		☐
Fairmont Hotel Commercial: Hotel	SJ-FAIR	2	Cooling Tower Water Softeners	6,956	$12,410	$6,387	1.94	2001	Need Owner's Approval	☐
Paramount Great America Commercial: Theme Park	SC-PARA	1	SBWR for Ponds & Irrigation	0	$53,177	$44,085	1.21	Completed	Completed	☑
Paramount Great America Commercial: Theme Park	SC-PARA	2	Install Low Flow Fixtures	69,308	$1,072,057	$25,926	41.35		Only as needed with remodeling	☐
Paramount Great America Commercial: Theme Park	SC-PARA	3	Pump Gland water substitution	0	$34,521	$5,896	5.85		Not Cost Effective, no flow data, sewer benefits, not included	☐
Paramount Great America Commercial: Theme Park	SC-PARA	4	Faucet Modifications	1,700	$1,235	$1,073	1.15	TBD		☐
Paramount Great America Commercial: Theme Park	SC-PARA	6	Nickelodeon backwash reroute for reuse	18,000	$62,116	$4,158	14.94		Not Cost Effective	☐
Paramount Great America Commercial: Theme Park	SC-PARA	7	Water saver for laundry	874	$12,410	$301	41.23		Not Cost Effective	☐
IBM Corporation Disk/Head Manufacturer	SJ-007A	1	Reuse treated rinse water, CT blowdown & R.O. reject for	122,500	$1,985,970	$143,000	14.00			☐
IBM Corporation Disk/Head Manufacturer	SJ-007A	1RCM	Install ULFTs	43,450	$0	$0	0.00			☐
IBM Corporation Disk/Head Manufacturer	SJ-007A	2	Increase R.O. Feed water recovery.	109,500	$837,970	$85,000	10.00		Similar to second pass RO with ion exchange softener	☐
IBM Corporation Disk/Head Manufacturer	SJ-007A	2RCM	Reuse treated wastewater for pump seals at Conc. Plant	7,200	$0	$0	0.00			☐
IBM Corporation Disk/Head Manufacturer	SJ-007A	3RCM	Recycle vacuum pump seal water	7,200	$0	$0	0.00			☐
Komag Inc. Bldg 10 Disk/Head Manufacturer	SJ-341A		None	0	$0	$0	0.00			☐
Read-Rite Corp. Disk/Head Manufacturer	MI-004A	II.A.	Reuse of process water for irrigation	1,850	$0	$0	0.00			☐
Read-Rite Corp. Disk/Head Manufacturer	MI-004A	II.AI	Cooling tower cycles improved to 5.5.	20,250	$0	$0	0.00			☐
Read-Rite Corp. Disk/Head Manufacturer	MI-004A	V.C.	Employee training	1,500	$0	$0	0.00			☐
Santa Clara County, Elmwood Correctional Facility Institutional: Correctional	MI-ELMW	1	Shower Head Replacement	2,965	$42,693	$11,892	3.59	TBD	Implementation schedule to be determined	☐

Flow Audit Study Projects Summary

Company Information		*#*	*Description*	*Chg in Flow (gpd)*	*Capital Cost*	*Annual Benefit*	*Payback (Years)*	*Project Completion Date*	*Comments*	*Done*
Santa Clara County, Elmwood Correctional Facility Institutional: Correctional	MI-ELMW	2	Urinals Replacement	980	$34,039	$1,687	20.18			☐
Santa Clara County, Elmwood Correctional Facility Institutional: Correctional	MI-ELMW	3	Toilet Replacement	4,200	$75,030	$7,220	10.39			☐
Santa Clara County, Elmwood Correctional Facility Institutional: Correctional	MI-ELMW	5	Cafeteria Pot Wash Restrictors/Timers	1,344	$1,295	$2,307	0.56	TBD	Implementation schedule to be determined	☐
Santa Clara County, Elmwood Correctional Facility Institutional: Correctional	MI-ELMW	6	Faucet Spring Load	1,800	$30,368	$1,453	20.90			☐
Santa Clara County, Main County Jail Institutional: Correctional	SJ-MAIN	1	Replace Showerheads	1,092	$8,537	$1,563	5.46			☐
Santa Clara County, Main County Jail Institutional: Correctional	SJ-MAIN	2	Flushometer and Urinal replacement	560	$39,378	$806	48.86			☐
Santa Clara County, Main County Jail Institutional: Correctional	SJ-MAIN	3	Toilet Replacement	2,088	$32,065	$2,933	10.93			☐
Santa Clara County, Main County Jail Institutional: Correctional	SJ-MAIN	5	Pot Wash Timers/Controls	1,520	$1,294	$2,173	0.60	TBD	Implementation schedule to be determined	☐
Santa Clara County, Main County Jail Institutional: Correctional	SJ-MAIN	6	Cooling Tower Optimization to 5 cycles	1,974	$39,773	$12,538	3.17	TBD	Implementation schedule to be determined	☐
San Jose State University Institutional: Educational	SJ-SJSU	1	Urinal replacement	300	$22,645	$471	48.08			☐
San Jose State University Institutional: Educational	SJ-SJSU	2	Toilet replacement	510	$23,699	$401	59.10			☐
San Jose State University Institutional: Educational	SJ-SJSU	3	Showerhead replacement	9,828	$32,748	$7,714	4.25	TBD		☐
San Jose State University Institutional: Educational	SJ-SJSU	4	SBWR for cooling towers	0	$39,684	$18,094	2.19	6/1/99		☑
San Jose State University Institutional: Educational	SJ-SJSU	5	SBWR for main campus irrigation		$58,021	$8,497	6.83	TBD	Awaiting DHS Approval	☐
San Jose State University Institutional: Educational	SJ-SJSU	6	Employee Awareness Training	0	$1,803	$856	2.11	TBD		☐
Santa Clara University Institutional: Educational	SC-UNIV		Toilets, urinals and lavatory fixtures	0	$0	$0	0.00	TBD	On an ongoing basis	☐
Santa Clara University Institutional: Educational	SC-UNIV		SBWR for irrigation	0	$58,021	$8,497	6.83	12/00	Already started	☐
Good Samaritan Hospital Institutional: Hospital	SJ-GOOD		Replace Cooling Tower for More Efficient Model	0	$0	$0	0.00	4/99	no cost or flow data provided	☑
San Jose Medical Center Institutional: Hospital	SJ-SJME	1	Vacuum Pump Water Recycle	3,400	$12,000	$4,000	3.00	3/1/00		☐
San Jose Medical Center Institutional: Hospital	SJ-SJME	2	Instrument Washers Sterris System	2,500	$80,000	$1,825	43.84	12/15/99		☐
San Jose Medical Center Institutional: Hospital	SJ-SJME	3	Waterless hand sanitizer	4,000	$0	$2,900	0.00		Capital cost and payback data not provided, implementation ongoing	☑

Flow Audit Study Projects Summary

Company Information		*#*	*Description*	*Chg in Flow (gpd)*	*Capital Cost*	*Annual Benefit*	*Payback (Years)*	*Project Completion Date*	*Comments*	*Done*
San Jose Medical Center Institutional: Hospital	SJ-SJME	4	Water Wise Employee Training	0	$0	$0	0.00		No flow or cost data or implementation date.	☑
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	01	Toilet Replacement (not including patients)	220	$20,001	$173	115.61		10 toilets per year, >5 year payback	☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	02	Sinks and Faucets		$0	$0	0.00		No flow or cost data given, not scheduled	☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	03	Showers	0	$0	$0	0.00		No flow or cost data given, not scheduled	☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	04	Cafeteria	400	$2,761	$314	8.79		>5 year payback	☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	05	Patient Care Faucets	0	$0	$0	0.00		Sink aerators considered not applicable due to OSHPD	☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	06	Patient Care Toilets	0	$0	$0	0.00		Stated as not applicable due to OSHPD objections, but OSHPD said OK	☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	07	Patient Care Restrooms and Bathtubs	0	$0	$0	0.00		Sink aerators considered not applicable due to OSHPD, but shower heads OK	☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	09	Cooling Towers	7,675	$76,277	($1,182)	-64.53		No payback	☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	10	Vacuum Pumps/Breathing Air	10,080	$15,441	$5,563	2.78	TBD		☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	11	Cart washer	0	$0	$0	0.00		Not considered applicable due to OSHPD	☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	12	Sterilizers	0	$0	$0	0.00		Not considered applicable due to OSHPD	☐
Santa Clara Valley Medical Center Institutional: Hospital	SJ-SCVM	13	Employee Awareness Training	1,136	$2,293	$894	2.56	TBD		☐
Sorrento Cheese Co. Other Industrial: Food Processing	SJ-016C	1	Replacing 3 Toilets with Ultra Low Flow Fixtures	112	$16,434	$1,057	15.55			☐
Sorrento Cheese Co. Other Industrial: Food Processing	SJ-016C	2	Replacing 3 Vacuum Pumps with Steam Vacuum Eductors	28,300	$63,095	$16,981	3.72	1999		☑
Sorrento Cheese Co. Other Industrial: Food Processing	SJ-016C	3	Detergent Recovery	11,747	$294,931	$55,084	5.35	1999		☑
Sorrento Cheese Co. Other Industrial: Food Processing	SJ-016C	4	Reusing Process Water for Floor Cleaning	10,000	$285,710	$24,451	11.69			☐
Exchange Linen Services Other Industrial: Laundry	SJ-022C	1	Recycle treated wastewater (DAF) to washing process	46,045	$142,796	$42,893	3.33	11/2001		☐
Exchange Linen Services Other Industrial: Laundry	SJ-022C	1A	Retrofit toilets and urinals	344	$0	$0	0.00	4/2000	No cost data provided	☐
Exchange Linen Services Other Industrial: Laundry	SJ-022C	1B	Retrofit faucets with aerators	79	$0	$0	0.00	3/2000	No cost data provided	☐
Exchange Linen Services Other Industrial: Laundry	SJ-022C	1C	Retrofit shower	6	$0	$0	0.00	3/2000	No cost data provided	☐

Flow Audit Study Projects Summary

Company Information		*#*	*Description*	*Chg in Flow (gpd)*	*Capital Cost*	*Annual Benefit*	*Payback (Years)*	*Project Completion Date*	*Comments*	*Done*
Exchange Linen Services Other Industrial: Laundry	SJ-022C	2	Recycle extractor coolant water	1,000	$1,739	$2,979	0.58	5/2000		☐
California Paperboard Corp. Other Industrial: Paberboard	SC-005C		Water loop Project	0	$60,000	$0	0.00		Reduced solids discharging to the sewer by 50%, flow and cost not included	☑
California Paperboard Corp. Other Industrial: Paberboard	SC-005C		Purple Water Project (for processes)	0	$0	$0	0.00	TBD	Gradually increasing use	☑
California Paperboard Corp. Other Industrial: Paberboard	SC-005C		Inspection and Maintenance	20,000	$0	$0	0.00	6/3/99		☑
California Paperboard Corp. Other Industrial: Paberboard	SC-005C	1	Install Rossilator self purging shower systems	28,800	$92,300	$16,800	5.49			☐
California Paperboard Corp. Other Industrial: Paberboard	SC-005C	2	Pumpable Packing (no water used)	46,080	$46,800	$26,880	1.74	9/2001		☐
California Paperboard Corp. Other Industrial: Paberboard	SC-005C	IC	Replace showerheads with low flow fixtures	250	$0	$0	0.00	TBD	Not included in project summary	☐
California Paperboard Corp. Other Industrial: Paberboard	SC-005C	IIB	SBWR for irrigation	200	$0	$0	0.00	TBD	Not included in project summary	☐
California Paperboard Corp. Other Industrial: Paberboard	SC-005C	IIIA	Replace with mechanical seals	125	$0	$0	0.00	TBD	Not included in project summary	☐
California Paperboard Corp. Other Industrial: Paberboard	SC-005C	VA	Use of Statistical Process Control	0	$0	$0	0.00	TBD	Not included in project summary	☐
Jefferson Smurfit Other Industrial: Paperboard	SC-003C	1	Removal of anti-freeze water from clay pumps.	180	$210	$0	0.00	5/31/99		☑
Jefferson Smurfit Other Industrial: Paperboard	SC-003C	2	Instant hot water heaters on wash basins.	5	$600	$0	0.00	5/31/99		☑
Jefferson Smurfit Other Industrial: Paperboard	SC-003C	3	ULFT installation.	568	$5,499	$0	0.00	3/31/00		☑
Jefferson Smurfit Other Industrial: Paperboard	SC-003C	4	Shield shower nozzle size.	24,480	$1,280	$0	0.00	12/31/99		☑
Jefferson Smurfit Other Industrial: Paperboard	SC-003C	5	Internal lubrication shower for press roll	8,000	$5,000	$0	0.00	ongoing		☐
Jefferson Smurfit Other Industrial: Paperboard	SC-003C	6	SBWR water for irrigation	0	$0	$0	0.00	ongoing	SBWR replaces 3000 gpd water used, but not flow into sewer	☐
Jefferson Smurfit Other Industrial: Paperboard	SC-003C	7	SBWR water for cooling tower makeup	0	$0	$0	0.00	N/A	Not cost effective due to cycle up time (not evaluated in Worksheets 5D-5G)	☐
Jefferson Smurfit Other Industrial: Paperboard	SC-003C	8	Mechanical Seals	0	$0	$0	0.00	N/A	Already uses process water	☐
Jefferson Smurfit Other Industrial: Paperboard	SC-003C	9	Injectable Packing on Pumps (no seal water)	0	$0	$0	0.00	N/A	Already using process water	☐
Dynamic Details Printed Circuit Board Manufacturer	MI-014A	1	Bathroom modifications	1,975	$1,650	$2,739	0.60	5/13/99	Completed	☑
Dynamic Details Printed Circuit Board Manufacturer	MI-014A	2	Installing RO for to reuse process water for rinsing	43,200	$74,950	$28,697	2.72	12/31/00		☐

Flow Audit Study Projects Summary

Company Information		*#*	*Description*	*Chg in Flow (gpd)*	*Capital Cost*	*Annual Benefit*	*Payback (Years)*	*Project Completion Date*	*Comments*	*Done*
Dynamic Details Printed Circuit Board Manufacturer	MI-014A	3	Black Oxide/Multibond Automated Line	3,726	$200,000	$2,450	81.63	N/A		☐
Dynamic Details Printed Circuit Board Manufacturer	MI-014A	4	Copper Electro Plating - Flow Controls	2,880	$1,250	$1,900	0.66	2/10/00		☑
HADCO Printed Circuit Board Manufacturer	SC-027A	1	B-2 Line #2 Rinses retrofit Project	7,720	$895,685	$0	5.00	8/31/99	Payback was not calculated because not benefit given, but <5 year payback	☑
HADCO Printed Circuit Board Manufacturer	SC-027A	2	B-2 Line #3 rinses retrofit & developer rinse recycle project	10,600	$172,697	$0	5.00	11/30/99	Payback was not calculated because not benefit given, but < 5 year payback	☐
HADCO Printed Circuit Board Manufacturer	SC-027A	3	B-2 Line #4 rinses retrofit & developer project rinse water	10,600	$172,697	$0	5.00	11/30/99	Payback was not calculated because not benefit given, but < 5 year payback	☐
HADCO Printed Circuit Board Manufacturer	SC-027A	4	B-2 Line #5 rinses retrofit & developer project rinse water	10,600	$172,697	$0	5.00	11/30/99	Payback was not calculated because not benefit given, but <5 year payback	☐
HADCO Printed Circuit Board Manufacturer	SC-027A	5	Triple Rinse Drum wash station	6,281	$16,056	$0	0.00	TBD	No benefits or payback given	☐
HADCO Printed Circuit Board Manufacturer	SC-027A	NA	Showerheads	0	$0	$0	0.00	3/1/99	Not cost or flow data provided	☑
HADCO Printed Circuit Board Manufacturer	SC-027A	NA	Employee Training	0	$0	$0	0.00	2/5/99	Not cost or flow data provided	☑
Sanmina Corp. Plant I Printed Circuit Board Manufacturing	SJ-022A	1	Recycling of treated process wastewater in process	25,928	$117,387	$6,606	17.77	9/1/00		☐
Sanmina Corp. Plant II Printed Circuit Board Manufacturing	SJ-043A	1	Recycling of treated water into process	25,299	$117,387	$6,006	19.54	12/30/00		☐
Analog Devices, PMI Division Semiconductor	SC-060A	1	Upgrade DI Water System	22,777	$251,327	$96,574	2.66	4/18/99		☑
Analog Devices, PMI Division Semiconductor	SC-060A	2	Increase Capacity of Reclaim Water Holding Tank	7,280	$9,000	$3,800	2.37	4/15/99		☑
Hewlett Packard Semiconductor	SJ-003A	1	Domestic Flow Reduction (toilets and shower)	11,725	$0	$0	0.00	12/31/99	Cost data was left blank	☑
Hewlett Packard Semiconductor	SJ-003A	2	Move Bulk Storage Operation Overseas	18,720	$0	$0	0.00	04/23/99	Cost data was left blank	☑
Hewlett Packard Semiconductor	SJ-003A	3	Convert 4 Inch to 6 Inch Wafer Fab	45,000	$0	$0	0.00	12/31/00	Cost data was left blank	☐
Hewlett Packard Semiconductor	SJ-003A	4	DI Reclaim using EDI	36,000	$306,000	$127,810	2.39	01/01/02		☐
Hewlett Packard Semiconductor	SJ-003A	5	Divert Groundwater to Storm Drain	48,000	$5,000	$12,143	0.41	TBD		☑
Hewlett Packard Semiconductor	SJ-003A	6	Groundwater Reclaim Treatment for Facility Use	36,000	$425,000	($78,183)	-5.44			☐
Hewlett Packard Semiconductor	SJ-003A	7	Divert Liquid Ring Vacuum Pump Leak to Scrubber	2,400	$25,000	$971	25.75			☐
Hewlett Packard Semiconductor	SJ-003A	8	Idle flow rate reduction	1,000	$0	$0	0.00	11/01/99	Cost data was left blank	☐

Flow Audit Study Projects Summary

Company Information		*#*	*Description*	*Chg in Flow (gpd)*	*Capital Cost*	*Annual Benefit*	*Payback (Years)*	*Project Completion Date*	*Comments*	*Done*
Intel Corporation D2P3 Semiconductor	SC-249A	1	Ro Reject to the Cooling Towers	65,754	$43,600	$71,686	0.61	6/30/99		☑
Intel Corporation D2P3 Semiconductor	SC-249A	2	pH Control for Scrubbers	72,000	$236,590	$91,014	2.60	11/30/98		☑
Intel Corporation D2P3 Semiconductor	SC-249A	3	SBWR recycled water for irrigation	0	$0	$0	0.00	TBD	Currently working with SBWR to connect	☐
Intel Corporation, D2 Semiconductor	SC-028A	1	RO Reject to the Cooling Towers	43,836	$29,067	$47,389	0.61	06/30/99		☑
Intel Corporation, D2 Semiconductor	SC-028A	2	pH Control for the Scrubbers Project	115,200	$157,723	$77,446	2.04	11/30/98		☑
Intel Corporation, D2 Semiconductor	SC-028A	3	SBWR recycled water for irrigation	0	$0	$0	0.00	TBD	Currently working with SBWR to connect	☐
Linear Technology Semiconductor	MI-006A	1	Showerhead retrofit	40	$741	$52	14.14		Payback based on simple payback calculation	☑
Linear Technology Semiconductor	MI-006A	2	SBWR to Gray water (process reclaim) for low periods,	0	$69,525	($126)			Additional SBWR usage: 11,596 gpd. Neg Annual Benefit	☐
Linear Technology Semiconductor	MI-006A	3	Gray Water to Bldg. 2 Scrubber	0	$68,750	($1,240)			Additional SBWR usage: 2,452 gpd. Neg Annual Benefit	☐
Lockheed Martin Fairchild Systems Semiconductor	MI-072A	1	Rerouting RO Reject direct to sewer	525	$4,691	$205	28.24		In accordance with FAS, implementation not required at this time.	☐
Lockheed Martin Fairchild Systems Semiconductor	MI-072A	2	ULFTs and Urinals	780	$6,000	$1,110	5.40		In accordance with FAS, implementation not required at this time.	☐
Lockheed Martin Fairchild Systems Semiconductor	MI-072A	3	Replace showerheads	40	$25	$57	0.44		In accordance with FAS, implementation not required at this time.	☐
Lockheed Martin Fairchild Systems Semiconductor	MI-072A	4	Employee Training	1,500	$1,200	$2,135	0.56		In accordance with FAS, implementation not required at this time.	☐
LSI Logic Semiconductor	SC-046A	1	Process Wastewater to Scrubbers/CTs	43,600	$171,865	$19,103	9.00	5/30/00		☐
LSI Logic Semiconductor	SC-046A	2	Batch sink idle flow reduction	9,050	$8,500	$17,215	0.49	3/30/00	Completed	☑
LSI Logic Semiconductor	SC-046A	3	High Efficiency RO for Ultra Pure Water	43,600	$136,560	$15,047	9.08	5/24/99	Installed Installed	☑
Micrel Inc. Semiconductor	SJ-258A	2	Minimizing Fab Waste (repairing leaks, training, etc.)	7,200	$33,528	$51,237	0.65			☐
Micrel Inc. Semiconductor	SJ-258A	3	Reusing Process Water in Scrubbers	7,300	$168,610	$8,655	19.48		greater than 5 year payback	☐
Micrel Inc. Semiconductor	SJ-258A	4	Replacing Toilets and Urinals with Ultra Low Flush Fixtures	3,403	$65,949	$3,405	19.37		greater than 5 year payback, but will evaluate more fully	☐
Micrel Inc. Semiconductor	SJ-258A	5	Addition of Second RO for incoming process water	16,950	$163,922	$16,473	9.95	12/97	Already existing, just given for costs	☐
Micrel Inc. Semiconductor	SJ-258A	7	Optimization of Cooling Towers	10,303	$79,249	$21,353	3.71		Will evaluate with installation of new cooling towers	☐

Flow Audit Study Projects Summary

Company Information		*#*	*Description*	*Chg in Flow (gpd)*	*Capital Cost*	*Annual Benefit*	*Payback (Years)*	*Project Completion Date*	*Comments*	*Done*
Micrel Inc. Semiconductor	SJ-258A	8	Recycling pump “gland” water (seal water)	2,160	$7,480	$1,970	3.80	TBD	Implementation will be determined by Micrel	☐
Seagate Technology Semiconductor	MI-061A	1	Replacing Toilets with Ultra Low Flow Fixtures	2,489	$16,539	$2,900	5.70	TBD		☐
Seagate Technology Semiconductor	MI-061A	10	Spray Rinses	108,900	$0	$150,000	0.00	TBD	Project cost and payback need to be determined	☐
Seagate Technology Semiconductor	MI-061A	11	Wet Benches with built-in recycling	155,000	$0	$213,000	0.00	TBD	Project cost and payback need to be determined	☐
Seagate Technology Semiconductor	MI-061A	2	Reusing Process Water for Irrigation	12,672	$97,596	$39,700	2.46	TBD		☐
Seagate Technology Semiconductor	MI-061A	3	Reusing RO Reject/Process Water in Cooling Towers	29,000	$47,175	$17,345	2.72	TBD		☐
Seagate Technology Semiconductor	MI-061A	4	Counter Current Rinse Systems on Wash	28,800	$0	$35,000	0.00	TBD	Project cost and payback need to be determined	☐
Seagate Technology Semiconductor	MI-061A	5	Counter Current Rinse System on Final Clean	86,400	$0	$106,000	0.00	TBD	Project cost and payback need to be determined	☐
Seagate Technology Semiconductor	MI-061A	6	Reuse of Process Rinse Water	0	$0	$0	0.00	TBD	Project cost, annual benefit, and payback need to be determined	☐
Seagate Technology Semiconductor	MI-061A	7	Reuse of Treated Wastewater Project #1	558,000	$0	$560,000	0.00	TBD	Project cost and payback need to be determined, annual benefit similar to 4&5	☐
Seagate Technology Semiconductor	MI-061A	7a	Reuse of Treated Wastewater Project #2	558,000	$0	$200,000	0.00	TBD	Seagate indicated <1 payback, but no cost data provided.	☐
Seagate Technology Semiconductor	MI-061A	8	Air Agitation	148,600	$0	$20,000	0.00	TBD	Project cost and payback need to be determined	☐
Seagate Technology Semiconductor	MI-061A	9	Tank Arrangement	27,000	$0	$37,000	0.00	TBD	Project cost and payback need to be determined	☐
Unisil Semiconductor	SC-236A	A	RO Reclaim to Scrubber	4,000	$2,000	$1,000	2.00	1/99		☑
Unisil Semiconductor	SC-236A	B	Recycling of DI Process Water to rinses	20,000	$6,000	$3,000	2.00	2/98		☑
Unisil Semiconductor	SC-236A	C	Plate Dryer versus Plate Washer	100	$2,000	$10,000	0.20	1998		☑
UniSil Corp. Semiconductor	SC-295A	2	Replacing DI rinse water in lapping with RO reject or	12,000	$0	$0	0.00		No cost data or schedule for implementation	☐
UniSil Corp. Semiconductor	SC-295A	CT #1	Reusing RO Reject in 3 Cooling Towers	18,000	$7,500	$1,875	4.00	2001		☐
UniSil Corp. Semiconductor	SC-295A	CT #2	Reusing RO reject in 3 Fume Scrubbers and 1 NOX	20,000	$7,500	$1,875	4.00	2001		☐
Vishay - Siliconix, Inc. Semiconductor	SC-033A	01	SBWR for irrigation	0	$27,113	$1,212	22.37		>5 year payback	☐
Vishay - Siliconix, Inc. Semiconductor	SC-033A	02	Replace toilets/urinals with ultra-low flow fixtures	6,264	$320,894	$5,237	61.27		>5 year payback	☐

Flow Audit Study Projects Summary

Company Information		*#*	*Description*	*Chg in Flow (gpd)*	*Capital Cost*	*Annual Benefit*	*Payback (Years)*	*Project Completion Date*	*Comments*	*Done*
Vishay - Siliconix, Inc. Semiconductor	SC-033A	03	Alternate Scrubber Supply	63,360	$174,219	$58,445	2.98	TBD	Cost Recalculated by ESD	☐
Vishay - Siliconix, Inc. Semiconductor	SC-033A	04	Optimize Control on Cooling Towers/Humidifiers	12,556	$82,163	$28,731	2.86	TBD	Cost Recalculated by ESD	☑
Vishay - Siliconix, Inc. Semiconductor	SC-033A	05	2nd stage RO	33,000	$207,590	$19,814	10.48	TBD	>5 year payback. Cost Recalculated by ESD	☐
Vishay - Siliconix, Inc. Semiconductor	SC-033A	06	Water conservation in Fab	73,200	$40,376	$131,969	0.31	TBD		☑
Vishay - Siliconix, Inc. Semiconductor	SC-033A	08	Add aerators/restrictors to faucets	1,350	$5,108	$1,063	4.81	TBD		☐
Vishay - Siliconix, Inc. Semiconductor	SC-033A	09	Liquid Ring Vacuum Pump Water Recycle	3,888	$6,066	$7,281	0.83	TBD	Cost Recalculated by ESD	☐
Vishay - Siliconix, Inc. Semiconductor	SC-033A	10	Pump gland water recycle	2,160	$11,357	$1,702	6.67		>5 year payback. Cost Recalculated by ESD	☐

Total for All Projects (gpd)	**3,515,125**	***gpd***	**154**	***Projects***
Total for <5 Year Payback	**952,929**	***gpd***	**51**	***Projects***
Total for Completed Projects	**669,693**	***gpd***	**36**	***Projects***